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The role of public participation in the protection and development of urban green space

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Abstract— Due to population growth and increasing pollution in the urban environment, it is increasingly vital role of green spaces. Green space as a natural filter to reduce environmental pollution and to ensure that the relative range of personal and social health of city residents and the environment is relaxed. Measure citizen satisfaction with existing services in the field of urban green space to enhance the quality of service is necessary. Today, the world of contemporary urban problems except by recognizing the needs, demands and attitudes of citizens' awareness cannot complete and may be fertile ground for reasonable and proper communication between the citizens and the citizens provide. One of the most important municipal services that have great impact on the mental health of its citizens, including the most important tasks is to change the culture of urban green space for numerous urban institutions and the citizens of one of the best methods to encourage them to maintain and develop the space green of urban

Keywords— pollution, citizens, green space, and partnerships.

I. Introduction

Development of green space due to population growth and construction of urban green space to balance human needs and essential social, physical and mental, is a vital. In most regions of the world, located in the dry zone, cities to cope with noise and air and it also reduce environmental stress than any other point on the green space needs. Green space as part of the city and part of the municipal services needed and it cannot be considered separately from the needs of the urban community The quantity and quality of green space should be proportional to the physical size of the city, according to community needs and develop ecological conditions in the process of expanding its To live as green space, environmental efficiency is constant [18].

Nowadays, the importance of public participation in the movement towards urban sustainable development uncovered [16]. To achieve the desired development pattern or the proper use of resources and opportunities and equitable distribution of resources, public participation is a central strategy it results [9].

The aim of this study was to examine the role of the Preservation and development of urban green space.

Literature

Green spaces in urban environments, to the extent that it is considered as one of the indicators of development communities.

Zaki poor (1999) showed that for the preservation and development of green space, identify needs, expectations and trends are essential for citizens and that more than anything else could be instrumental in this process is public participation.

Tehran about the role of citizen participation in environmental protection results showed a much higher level of education and length of residence of citizens Extent of their participation in protecting the environment is more significant relationship with the knowledge of citizens [21].

To analyze the issues and the environmental crisis and the lack of green space in the city of Mashhad, the results showed that the spatial distribution The standard of 12 square meters per capita green space in this paper is intended 11.36 square meters of green space per capita in the city of Mashhad which is also not the same in all areas, and this represents a mismatch between the spatial distribution of green space in the city of Mashhad [24].

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To analyze the quality of urban green space based on citizens satisfaction measurement results show Level of citizen satisfaction with the quality of urban green space on the logic of the medium is increased to 56%, But the social characteristics of the respondents such as age, education and awareness-significant differences among citizens is the responsibility of the Town[12].

The study of immigrant and native citizen participation in the preservation of green space in Mashhad Region 2 Region 3 showed Apart from that there is a relationship between people's willingness to participate in the preservation of green space and whether or not they are immigrants, Among other variables, including the responsibility to preserve green space and inform the incentive scheme and there is no relation and overall participation of the residents in this area is limited The need to inform and encourage people to participate more in this area to maintain, requiring[1].

Chysvra (2004) in a paper alluding to the importance of the role Parks sustainable urban green spaces in the city and the lack of international research in this area has attempted to highlight the importance of nature for the well-being of citizens and sustainable displayed. The study confirms that the origin of the positive feeling and experiencing nature in the urban environment is useful to human needs immaterial and spiritual care to meet the.

Contribute to rural development and knows the legitimacy of the results is Public participation to reduce the alienation of citizens, prevent conflict, the concept of the legislation, supporting enterprise applications and the blossoming of local knowledge led Governments participating in community education and democratic processes in such a dramatic increase occurs[20].

Participation of rural communities in order to make optimal use of available resources in the village sees a fundamental way in the implementation of rural development priorities [30]. Emphasis on the participation of rural communities as a step towards democracy and a sense of community organizations who knows to help their people in the village [28].

The three major factors that contribute to environmental outcomes associated with non-governmental organizations have studied the effect of the data. He concludes that the relationship between government and public institutions, community characteristics (experience, experience in problem solving and interaction of local organizations and institutions) and political and economic characteristics of farmers and others who benefit from the partnerships, it is important[5].

Materials and Methods

The present study is a practical and analytical approach. Data collection methods fall into two documents (library) and field survey has been conducted. It is necessary to define some of the pay:

Public Participation: Public participation in municipal decision-making activities and causes that help residents involved in the development activated, resulting in the creation of accomplishments, including Better environmental protection, high-spirited citizen, citizen satisfaction, a sense of belonging among citizens, financial savings, increased self-confidence and increase citizens' confidence in organizations[11].

Development: a creative process and innovation to make the underlying changes in the social system. Development of an historic change in all aspects of political, economic, cultural and social.

Green space, including areas that are part of the plant or any SPAD including trees, shrubs, flowers and lawns have to be taken [4]. All areas of natural or artificial vegetated productivity of their natural endowment of human attention [8].

Citizen: Citizen of the processes of modern society and the social status of civil society is seen in the attitude in which it is possible to enjoy the rights and powers provided [27].

Pollution: adverse changes in physical, chemical and biological air, water and soil. Impact on the lives of plants, animals and humans. Pollution arising makes from human problems through intensive agriculture, industrialization, urbanization, and transportation [4].

II. Results and discussion

. Urban green space is one of the most important municipal services, which now has a huge impact on the mental health of citizens and one of the most important tasks of urban entities is that citizens are able to balance safety and comfort for the pay talks [26] Both from the perspective of environmental and urban spaces that meet the needs of both the leisure and the provision of appropriate care in the context of communication and social interaction and criteria to assess the quality of the urban environment is considered[25]. several studies have shown that green space per year, a substantial part of the experience of change, loss of biological and mechanical green space, by citizens of the Because of the lack of information and ignorance that has substantially the relation with the environment of the urban green conference space[10]. It also has social and ecological efficiency are the most important effect of green space in cities, environmental practices, and their ecological efficiency that makes cities more conducive for living and coping with the negative effects of industrial development, and transportation and improve the quality of life of citizens it is. The importance of public urban green space shines as disturbing today as one of the criteria considered for development in communities [14].

Public's awareness of the need to protect and preserve green space and its role in creating the right culture. Appropriate debunk some of the green space and counter values of some common behaviors among people can bring a system of control and supervision of the spontaneous social. Such a

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function is very important and effective oversight of the operation of large numbers of police, military, municipalities, and two which are. Public participation in the preservation, restoration and development of green space, first of all requires culture and culture is a difficult task and takes time and requires the attention of all those involved, and the relevant and non-governmental inserts severest [18].

The importance of green space

With the expansion of cities and their suburbs, people have fallen away from the lap of nature, over-population density, making cleaning more difficult and has higher environment. In most large cities, villages and towns Diseases of physical and mental over low density. With the creation of green spaces and parks can be helped to improve the environment and provide conditions for better and healthier lives, the importance of green space can be expressed as follows:

1-Reduce the temperature and air temperature adjustment
2 - air filtration and increased humidity
3 - Creating a green space for recreation and resort and beautify the environment.
4 - Avoid erosion water, wind and earth
5 - Reduce sound pollution [23].

Strategies for maintaining and developing the green space

Proposed measures to preserve and develop urban green spaces include:

Develop a comprehensive plan for green space Promote the role of Providing education, strengthen the sense of responsibility in people and ... **Improving ecological green space** : Preserving green space and avoid damages Management of street trees and public parks Selection of appropriate species Scientific principles at sowing Scientific principles of plant maintenance Urban Forestry Location in order to create and develop urban green space The possibility of mountain ecosystems as Highland Park Investigate the feasibility of using abandoned urban areas to promote greening .

Improving Social Landscape

Safety, security, equipment, facilities, easy accessibility, consistency, active management, appropriate distribution[3].

People involved in the preservation of green space

Today, population growth and the expansion of urban areas, the term urban green spaces, landscaping and more applications are under consideration [22]. The larger cities are also increasing need for green space in the urban landscape, vegetation typical of the urban land use of man making the same time, 'social yields "both fide" return ecologically "[15].

In fact, the importance of urban green space to the extent that today this user as a community development index considered[13] And many experts believe that architecture and urban green space on humans, and safety and psychological comfort In many cases the most important factor to reduce environmental pollution is[19] one of the most important things to maintain and expand green space in cities, the participation of residents In fact, in the world of contemporary urban issues resolved except by recognizing the needs, demands and attitudes of citizens are not allowed And awareness can be fertile ground for reasonable and accurate communication between institutions and citizens to provide services to citizens. The social partnership is largely a community health guarantee, improvement and development of a community. Social participation of citizens in defining the process in which citizens are empowered. To participate actively in decisions related to their lives, the implementation of policies, planning, developing and providing services and carrying out practical activities for the changes to participate [29]. According to Durkheim, in connection with the participation of the citizens' sense of belonging to their community, they are necessary conditions for social, moral, and be provided with the rise of social belonging, community involvement increases[6]. According to Huntington and Nelson, political participation and social function of economic and social development process. For example, community participation can be a function of higher social status (education and income) recognized that social mobility is achieved as a result [2]. In this connection the investigations of citizen participation in the green debate, the evolution of culture and encourage them to participate is one of the best ways to maintain and develop urban green spaces. Creating local and regional youth and women's organizations, student organizations, provides a means of physical development of urban green space [7].

One of the major issues of green space in the nearly four-season climate conditions require continuous care costs and, Issue is landscaping maintenance and development of green spaces available ranging from wooded, **Chamankar**, flower, fountain, and other comforts, should be constantly alert and refreshed and naturally as possible and kept alive One of Hong Kong's participation in the field of urban green spaces in the city pay for the implementation of urban green space Most people pay this amount in order to improve air quality and sensible people knew that her concerns about the health of its own [31].

In this regard, the use of public participation is an imperative need, given that urban green space management, management of human, natural and environmental elements in the scope of work and life, his Remove and discontinue participation link citizens or residents of the municipality, ie users of Directors of green space in urban environments, as the retention forces accelerator engine of urban management.

Citizens are indifferent or ignoring the crucial role of

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service users in the process of implementation and monitoring of urban policy in the chain, and work in order to achieve the goals of the program any effort by the even impossible disrupt WinZip, In a word can be said to have a relationship with the urban environment is the main factor to be considered in the management of green spaces [3].

Strategies for public participation in the preservation of green space

Although the issue of participation in culture and different sources have different meanings and is divided into several types, but the goal of this type of collaboration, cooperation and solidarity among the people involved in the many cultural, political and economic related itself. Accordingly, we have tried to find ways that they can be used by people involved in the preservation of green space gained as follows:

1-The use and benefit of the mass media, especially radio and television as a benchmark for the preparation and presentation of reports documenting And using existing footage showing the importance of green space in physical and mental health of citizens and the emphasis on the need to maintain and support it deserves.

2-Enable large areas of school education in the field of design, predict and explain the importance of green areas for green space for children's and using this potential, many and free for the green and tree planting and cultivation flowers and grass in the school yard, alleys and streets surrounding it.

3- The establishment of protecting natural resources for national participation in the conservation, restoration and development of natural resources in the design of military service personnel to implement projects for the conservation, restoration, and develop green space be used. One advantage of the wide dissemination of the culture of green space in the community. For people who are involved in these projects, sooner or later, in the context of economic, social and cultural well.

4- The other approaches can be formed (the National Park) in any of the parks mentioned. Volunteers or members of the Friends of the Park District and the resident or their beneficiaries. Coordinating council could take charge of the park or green space managers who می کوشند merely useful and productive relationship between management and the creation of green space and strengthen.

National Parks Association of Home and School Council as well as in the schools, the efforts to win the support of the action taken by citizens of the local landscape, innovative policies for the citizens of the park as well provide entertainment native, of Art and holding family celebrations, national, religious, compile and run it. As such, the views, wishes and problems in the area of green space and parks along the limit of the issues as directly responsible for the organization in charge of green space within urban management issues faced by them against each other is a very useful communication channels or ducts, and transcendence arise.

5- On the maintenance and development of green spaces can arrange the green space within the classification of municipalities Residents, local businesses, employees and families in the area adjacent sites in the preservation and development of green space and active participation of the community.

6- The local council is somehow involved in the maintenance and development of green space and between different neighborhoods competes to create a constructive and friendly service And every 3 or 6 months or a year the neighborhood with mostly done through mass media, the importance of television, radio, newspapers and magazines in the country and install signs throughout the city and encouraged the introduction taken into account.

7- The atmospheric setting the agenda of all those who work in the past or present of research, teaching and administration in other parts of the world will be invited.

Patients were considered (Honorary Fellow of green space) has been working cards and if necessary can be of assistance and help from other municipal officers and emergency police assistance in compliance with the legal aspects of the country.

8- Classes in relation to the preservation of green space for children in nursery schools, primary and secondary education and distribution of cards and posters, in this class in order to entice them to participate in landscaping projects and selection of volunteers and special cards for them [12].

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A Eco-Efficient Concrete Made with Ceramic Sanitary Ware Industry Waste, Integration with Nano-SiO_2 as Cement

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Abstract— Sanitary ceramic ware waste is classified as belonging to group of non-biodegradable industrial waste. Due to its physical, chemical and mechanical properties, the waste inevitably generated by the ceramic sanitary ware industry can be used in the production of concrete. This study investigates the feasibility of replacing 5, 10 and 15 percent of recycled sanitary ware powder, separately or in combination with nano silica powder, as part of the cement in concrete. For this purpose, the compressive strength and water absorption of concrete specimens at different curing times were investigated. Results show that using only sanitary ware wastes in concrete, reduces the compressive strength in early ages and water absorption. Also, using nano-silica powder in combination with sanitary ware powder compensates the reduction of compressive strength, while it induces further reduction in water absorption. Eventually, it can be concluded that using the wastes of sanitary ware industry, leads to proper recycling of these wastes, reduction in cement consumption, assist in construction economy and Protecting the environment.

Keywords— Ceramic Sanitary Ware Waste, Nano-Silica, Compressive Strength and Water Absorption, Sustainable Development.

I. Introduction

INDUSTRIAL waste management constitutes one of the major global problems of our times. Recycling of non-biodegradable waste is particularly difficult. Ceramic waste has been classified in this group. Due to the fact, that biodegradation period of ceramic is very long (up to 4 thousand years) and ceramic industry waste constitutes significant share in the total production, recycling of ceramic waste is a big problem.

Ceramic ware can be divided into two groups, depending on the materials used for its production. The first group includes products of burned red clay (bricks, structural wall and floor tiles, roof tiles). Products made of white clay: technical ceramics (ceramic electrical insulators), ceramic sanitary ware (wash bowls, lavatory pans, bidets, bath tubs), medical and laboratory vessels, belong to second group. Ceramic sanitary ware wastes come from defective wares rejected during quality control. Main defects include cracks, nicks, and glaze damage.

One of the natural ways of reusing inorganic industrial wastes, is their use in the production of building materials, especially as raw materials in the concrete manufacture. This manner of recycling has positive impact on the environment– it reduces the amount of deposited waste and limits mining of mineral deposits

Modern experiments on the use of ceramic wastes have been primarily focused on its environmental impact. Crushed ceramic waste is used as an admixture to traditional aggregates or as a substitute for some part of aggregate of a chosen dimension [1–10] and the powder obtained from crushed ceramic waste is used as pozzolanic admixture to Portland cement [11–18]. All studies have confirmed the possibility to use ceramic waste in concrete, however due to different properties of ceramic wastes, parameters of obtained concrete types also differ.

The present research is part of an experimental study on the feasibility of replacing 5, 10 and 15 percent of recycled sanitary ware powder, separately or in combination with nano silica powder, as part of the cement in the production of structural concrete. The results obtained from compressive strength and water absorption tests, shows the effects of this substitution on concrete properties.

The use of this waste in concrete, not only reduces wastes and leads to their proper recycling but also helps the economy of construction and environment by decreasing cement consumption. Moreover, the use of ceramic sanitary ware wastes in the cement and concrete industry contributes to sustainable development as well.

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II. MATERIALS

A. Ceramic Sanitary Ware Waste

The ceramic sanitary ware waste used in this study was obtained from recycled ceramic sanitary supplied by Shahrekord Pardis Ceramic Sanitary Ware Company in Iran. Cracked pieces of ceramic wash basin were crushed by a jaw crusher. Then, at the laboratory scale, the ceramic wash basin wastes were milled with an air jet mill to obtain ceramic powder. The resulting powders were sieved through a 75-µm (200 meshes) sieve. The ceramic waste powder preparation process is shown in Fig. 1.

The chemical compositions of sanitary ceramic powder were analyzed, and the results obtained are reported in Table I.

The pozzolanic properties of ceramic powder were investigated and are shown in Table II. The pozzolanic properties conform to ASTM C 618. According to this table, it is clear that ceramic sanitary waste powder can be used as a pozzolan. The sanitary ceramic powder included approximately 92.2 percent pozzolanic materials, and Al_2O_3 and SiO_2 were the main components.

Fig 1. Ceramic waste powder preparation process.

TABLE I: Results of chemical analysis of sanitary ceramic powder

Chemical Compositions	Value (%)
SiO_2	67.63
Al_2O_3	24.05
K_2O	3.0
NiO	2.78
Na_2O	1.25
Fe_2O_3	0.55
Mo_2O_3	0.37
MgO	0.36

TABLE II: Comparison of pozzolanic properties of ceramic powder with ASTM C 618.

Parameter	ASTM C 618 (%)	Ceramic Powder(%)
(SiO_2+Al_2O_3+Fe_2O_3)	>70	92.23
SO_3	<3.0	<0.01
L.O.I.	<10	1.1
Moisture Content	<3.0	-
Fineness + 325 Mesh	<34	32

The SiO_2 and Al_2O_3 in the sanitary ceramic powder could be reacted with $Ca(OH)_2$ in the cement paste to produce crystalline C–A–H and low density C–S–H gel, which can fill micro pores in concrete, increase the bond strength between the interface of aggregates, decrease the permeability and improve the durability of the concrete.

B. Nano-silica

Nano-SiO_2 was purchased from Degussa, Germany chemical company, and its main properties are given in Table III. Range of particle size by SEM analysis in the materials laboratory has been confirmed.

TABLE III: Properties of Nano-SiO_2

Chemical Compositions	Value	Physical Properties	Characteristics
SiO_2	>99%	APS	11-14nm
Ti	<100ppm	SSA	190-685m^2/g
Ca	<77ppm	Bulk Density	<0.11g/cm^3
Na	<63ppm	True Density	2.2 g/cm^3
Fe	<20ppm	Purity	+99%
		Color	White

C. Cement

Locally available Portland cement (ASTM Type II) was used. The specifications of the cement are shown in Table IV.

TABLE IV: Properties of Portland cement Type II Shahrekord

Chemical Properties	Percent	Physical Properties	Value
SiO_2	21.2-21.8	Initial Setting	90-110 min
Al_2O_3	4.8-5.2	Final Setting	150-190 min
Fe_2O_3	3.86-4.12	Fineness (Blain)	≥2900 cm2/g
CaO	64.5-64.9		
MgO	≤1.7	Autoclave Expansion	≤0.15 %
Cl	≤0.03		
SO_3	≤1.7.	3 Days Compressive Strength	≥22 Mpa
L.O.I	≤1.3		
LnR	≤0.65	7 Days Compressive Strength	≥36 Mpa
C_3A	≤7.5		
Total Alkali	≤0.7	28 Days Compressive Strength	≥53 Mpa

D.Aggregate

The sand and the coarse aggregate used in this research were supplied by the mines in Shahrekord (in Iran). In order to prevent gradation changes, all of the materials as lump were

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bought and stored. The grading curve of the sand in use has revealed that the sand falls into the allowable range defined by the ASTM-C33 standard. However, the gravel in use did not fall in the allowable range. Therefore, grading of the gravel was first modified according to the aforementioned standard and then the gravel was used.

The water absorption, particle size distribution, density and fineness modulus of the aggregates were specified as the tests methods described in ASTM. The physical properties of the aggregates are given in Table V.

TABLE V: Physical and mechanical properties of the aggregates

Property	Fine Aggregate	Coarse Aggregate
Specific Gravity	2.62	2.6
Fineness Modules	2.9	-
Water Absorption (%)	1.5	0.5
Maximum Size (mm)	4.75	9.5
Bulk Density (kg/m3)	1530	1583
Abrasion Value (%)	-	20.16

TABLE VI: Concrete mixture proportions (unit: kg/m^3)

Mixture name	Cement	sanitary ceramic powder	Nano-SiO_2	Coarse aggregate	Fine aggregate	Water	Superplasticizer
CS0	570	-	-	724	836	211	0.59
CS5	541.5	28.5	-	724	836	211	0.59
CS10	513	57	-	724	836	211	0.59
CS15	484.5	85.5	-	724	836	211	0.59
CS5N0.5	538.7	28.5	2.8	724	836	211	0.63
CS5N0.8	536.9	28.5	4.6	724	836	211	0.73
CS10N0.5	510.2	57	2.8	724	836	211	0.63
CS10N0.8	508.4	57	4.6	724	836	211	0.73
CS15N0.5	481.7	85.5	2.8	724	836	211	0.63
CS15N0.8	479.9	85.5	4.6	724	836	211	0.73

E. Water

The water used in the concrete, was the drinking water of Shahrekord city. The PH, sulphate content and chloride content of the water used in the study were 7.8, 29 mg/lit and 40 mg/lit, respectively.

F. Superplasticizer

The superplasticizer used is based on Polycarboxylate. The properties of the superplasticizer used in this study were a PH of 5.6, a yellow color, a specific gravity (g/cm³) of 1.2, free of chlorides and has solubility in water.

III. MIX PROPORTIONS, MANUFACTURING AND CURING OF SAMPLES

After preparing the materials and determining the required specifications, the mix design of control concrete (concrete without additives) with cement cutie of 570 and water to cement ratio of W/C=0.37 was used. In the next 9 designs (concrete with additives) cement is partially replaced with the amount of available pozzolan (ceramic powder and nano silica). In all cases, superplasticizer is added to concrete to increase its flow. Table VI shows the mix designs presented in this research. In the naming, CS0 means control concrete, CS means sanitary ceramic powder, N means nano silica, and the number is written in front of each of them represents the percentage of replacing instead of cement.

The concrete mixtures were mixed in accordance with ASTM C 192 in a 120 litre drum mixer. To distribute uniformly nano-SiO_2 particles were stirred in water for one minute at 120 RPM, and then they were added to the mixture. The test specimens were cast in steel cubic moulds (100×100×100 mm) and compacted on a vibrating table. After approximately 24 hours, the specimens were removed from the moulds. The concrete specimens were cured in lime-saturated water at 21 ºC in cure tanks until 28 days and then were cured in dry environment until 90 days. Casting, compaction, and curing were accomplished according to ASTM C 192 -81.

For each mix, cubic samples were tested to determine the compressive strengths at 7, 28 and 56 days of curing. The compressive strength for each mixture was obtained from an average of three cubic specimens. A 2000-kN capacity uniaxial compressive testing machine was used to test the specimens. The water absorption test according to ASTM C 642 was conducted at the end of the 90th day. Fig. 2 shows manufacturing and curing of cubic samples.

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Fig. 2. Manufacturing and curing of cubic samples

IV. RESULTS AND DISCUSSION

The average results obtained from the compressive strength (7, 28 and 56 days) of specimens containing sanitary ware powder compared to the control concrete is presented in Fig. 3

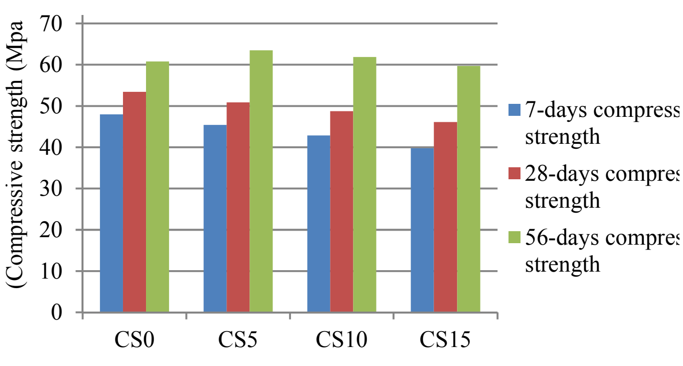

Fig. 3. Compressive strength

The results indicate, as expected, large differences at early curing ages and smaller differences at long curing ages. The 7th day compressive strength varied between 38.8 and 48 Mpa, and the 56th day strength varied between 59.7 and 63.5 Mpa. The compressive strength decreased as the proportion of sanitary ceramic powder in the concrete increased.

As it was observed, increasing the strength in the samples containing pozzolan (sanitary ceramic powder) started after 28 days of curing. According to Fig. 3, it was found that the compressive strength of samples containing sanitary ware powder after 7 and 28 days of curing was lower than the compressive strength of the control sample (CS0). At older ages (56 days), samples of containing sanitary ware powder have gained additional strength from the control sample (CS0). It shows that pozzolanic activity was begun approximately the age of 28 days of curing. Similar results of previous studies, at early curing ages, pozzolan only acts as filler and does not undergo the pozzolanic reaction. The reduction in the early compressive strength is mainly due to the immature pozzolanic reaction in the concrete and the preventive growth of C–S–H gel affected by components in sanitary ceramic powder.

The average results obtained from the compressive strength (7, 28 and 56 days) of samples containing sanitary ware powder with nano-silica is presented in Fig. 4.

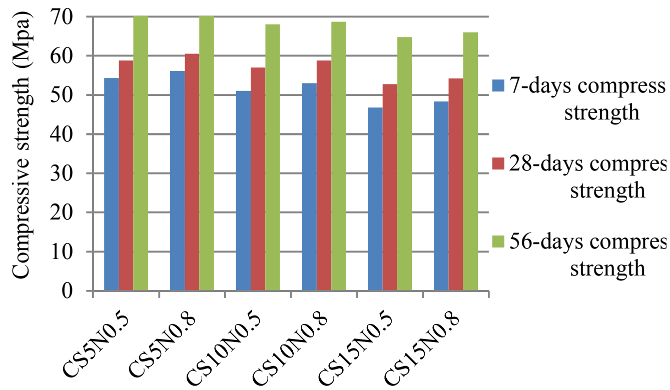

Fig. 4. Compressive strength

In general, the compressive strength of the concrete specimens decreased as increasing amounts of sanitary ceramic powder was added. Furthermore, the addition of nano-SiO_2 is helpful for the improvement of the compressive strength in the concrete specimens. The compressive strength developed in concrete containing nano-SiO_2 and sanitary ceramic powder, was higher than that of the control sample (CS0) and samples containing of sanitary ceramic powder (CS5, CS10, CS15).

The maximum compressive strength was obtained in the sample containing 0.8 percent nano-SiO_2 and 5 percent sanitary ceramic powder (CS5N0.8). In addition, by using 0.5 percent of nano-SiO_2 and 15 percent of ceramic wash bowl powder, the lowest compressive strength was determined (CS15N0.5).

The pozzolanic activity of nano-SiO_2 on the compressive strength was more effective at early curing ages, but, for the samples that only contained sanitary ware ceramic powder, it was found at older age. According to Fig. 4, for the sample CS5N0.5, which contains 5 percent ceramic powder (same as CS5) and 0.5 percent nano-SiO_2, it was found that the compressive strength after 7 days of curing was higher than CS5, and it was even higher than the compressive strength of the control sample (CS0). This surprising increase was due to the effect of the nano-SiO_2 reaction at an early age.

The simultaneous impact of using nano-SiO_2 and sanitary ware ceramic powder on the increasing compressive strength was much more than ceramic powder effect separately. The strength of the concrete samples was found to increase as the

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nano-SiO_2 content increased from 0.5% to 0.8%. However, the compressive strength of samples with 0.5 and 0.8 percent nano-SiO_2 was obtained nearly the same.

The water absorption test was performed on all mixtures; the results on the 90th day of curing are shown in Fig. 5.

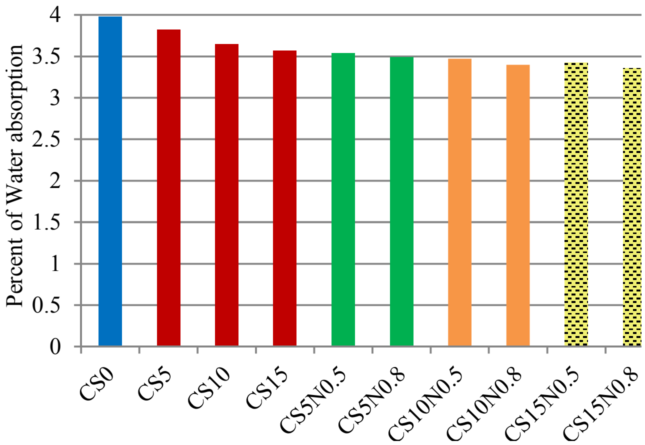

Fig. 5. Water absorption.

Fig. 5 shows that pozzolanic concretes possesses a lower water absorption capacity compared to the control concrete (CS0). Also shows that by increasing the amount of ceramic powder from 5 to 15 percent and nano-silica from 0.5 to 0.8 percent a dramatic decrease occurred in water absorption. The pozzolanic reaction which occurs in concretes containing sanitary ceramic powder, has an effect that leads to a lower water absorption capacity of the concrete. Furthermore, filler and pozzolanic effects of nano silica, in concretes containing ceramic powder and nano silica, leads to a lower water absorption capacity compared to control sample (CS0) and samples containing of sanitary ceramic powder (CS5, CS10, CS15).

Finally, it can be concluded that application of up to 10% of sanitary ceramic powder alone does not have a negative effect on concrete compressive strength in the long run. However, this powder can reduce concrete compressive strength at early ages. In addition, use of 15% of sanitary ceramic powder leads to a 1.1 MPa decrease in the compressive strength of 56-day concrete. This decrease is negligible. In order to compensate reduction in compressive strength of concrete at early ages, the possibility of using active pozzolan at early ages, such as nano silica, there. Considering the level of toxic gases produced by cement factories, use of only 10% of pozzolan, as a substitute for cement, reduces CO_2 content into the amount of 310 million tons and NO_x content into the amount of 710 million tons annually. Moreover, use of wastes has economic benefits.

Since 60 million tons of cement is used annually in Iran, if 5% of concrete projects use 10 to 15% of pozzolanic wastes, all of the annual waste production of Iran will be consumed. In addition, if the consumption continues and 10% of projects in the country use this material, all of the wastes produced in the past years will be used in concrete over a few years. This way, the rate of consumption of national resources declines and the environmental pollution resulting from wastes is also reduced.

V.CONCLUSIONS AND SUGGESTIONS

In this research, the feasibility of replacing 5, 10 and 15 percent of recycled sanitary ware powder, separately or in combination with nano silica powder, as part of the cement in concrete was investigated and the effects of these materials on the compressive strength and water absorption in different ages were studied. Results of the research are as follows:

- The compressive strengths of samples decrease with increasing sanitary ceramic powder content, especially at early ages. However, the results show that concrete containing sanitary ceramic powder (up to 15%), ultimately demonstrates minor strength loss at older ages. So, sanitary ceramic powder is a suitable pozzolanic material and can be used as a cement replacement.
- Nano-SiO_2 improves the mechanical properties of pozzolanic samples. The greatest impact of adding nano-SiO_2 on compressive strength was observed at early curing ages. Because of the reduction of the compressive strength of concrete due to the use of ceramic powder was observed at an early ages, the addition of nano-SiO_2 could effectively compensate for it.
- The maximum compressive strength was obtained in the sample containing 0.8 percent nano-SiO_2 and 5 percent sanitary ceramic powder (CS5N0.8).
- A very slight difference in the mechanical properties of concrete with the use of 0.5 or 0.8 percent of nano-SiO_2 was observed.
- Pozzolanic concretes possesses a lower water absorption capacity compared to the control concrete (CS0). By increasing the amount of ceramic powder from 5 to 15 percent and nano-silica from 0.5 to 0.8 percent a dramatic decrease occurred in water absorption.
- Due to the nature of the waste material, the only cost of producing them is the costs of collection and the mill. However, in the case of mass production, production cost of this wastes is less than the production cost of cement. As a result, these materials are economically suitable for use in concrete.
- The high amount of wastes resulted from ceramic sanitary ware industry as well as their non-renewable and useless nature create unsuitable and ugly scenes in city borders. Therefore, the use of these materials in concrete is a large step toward the management of wastes and improvement of

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the environment.

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Quality and quantity of solar radiation energy in Iranian desert

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Abstract— Renewable energy refers so unlike non-renewable energies are capable of returning to nature. In recent years, the environmental problems caused by global climate change and the use of renewable energy sources of energy have intensified. Iran's geographical position makes it a great source of solar and wind energy that is available. The renewable energy source, free and environmentally compatible. The most important factor for the proper design of solar devices and general applications of solar energy in every place, and statistical information about the amount of solar radiation is the place. Identification of suitable sites for deployment of renewable energies such as solar energy is required. Iranian deserts, including areas that have a high potential for solar energy. In this paper cities including Kerman, Yazd, Shiraz, Isfahan, Zahedan, which are located in the desert area of highest intensity of solar radiation are examined. The amount of energy received during the day from the Meteorological Agency statistical information on energy intake during the 10-year period (1389-1380) was received. The results show that the highest sunshine hours per day in 5 cities started in April and May to reach its peak and then it decreases the amount of solar energy received at least a month in Novamber. Using renewable energy can reduce greenhouse gas emissions and subsequent impacts of burning fossil fuels and gases such as carbon dioxide increases in charges against nature. Generation of electricity using solar energy power plants, solar water heating (solar water heaters for homes, factories, etc.), heating and indoor air ... Be used. Approach to renewable energy like solar power in desert areas to provide appropriate facilities to attract people to get to keep a percentage of the desert.

Keywords— Renewable energy, desert area, sources

I. Introduction

History of Solar Energy
Understanding solar energy and use it for various purposes goes back to prehistoric times, perhaps as early pottery. At that time the temple priests to help large bowl polished golden sun, Tshdanhay altar were lit. Pharaonic Egypt was a temple built with its doors open sunrise to sunset gates were closed.

But the story that has been expressed about the use of the sun, the story of Archimedes, the ancient Greek scientist and inventor, is a large Roman fleet using solar thermal energy to fire. Archimedes said that with the installation of a large number of small square mirror mounted on a mobile base located next to each other, Remote solar radiation and thus they focused on Roman ships on fire In Iran, the ancient Iranian traditional architecture indicates their special attention on the correct and effective use of solar energy has been for long time. For example, the walls of old houses made of mud and straw.

With regard to the type of wall heat transfer rate is low, the heat absorbed during the day by a few hours late at night, that enters the house Due to the limitations of many desert areas such as the lack of rainfall, rainfall anomalies and can be used to optimize the potential of solar radiation in deserts. In this paper we investigate the potential of solar radiation in deserts like the cities like Tehran, Shiraz, Zahedan, Yazd and Isfahan.

II. Literature

Climate change is one of the problems of the world today. Since the industrial revolution, human activities, especially the use of fossil fuels to generate electricity, is one of the possible causes of climate change. One of the solutions that have been proposed in this field today is strictly followed; the use of renewable energy sources and is environmentally friendly. Renewable energy sources are those that are not perishable, such as solar energy, wind energy, wave energy, tidal energy and geothermal energy. In addition to these sources of renewable, environmentally compatible and do not cause environmental pollution [5]. Extent of human demand on resources is a fundamental problem in human life. Efforts to reach an inexhaustible source of energy are the energy of the ancient human desires However, due to the increasing need for energy and resources on the one hand and increasing

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environmental pollution caused by fossil fuel burning sources on the other hand, Using renewable energy is becoming more and more important [4]. Excessive consumption of energy, especially fossil fuels to achieve the goals of economic growth and, in addition, lack of efficiency in the use of environmental pollution is increasing. The major cause of air pollution emissions of carbon dioxide, one of the main types of greenhouse gases, the result of fossil fuel consumption in the manufacturing, commercial, and residential services is [3]. About 90 percent of the required industrial countries come from fossil fuels. The world's growing need for energy in the future for three reasons, namely population growth, continued strong growth in industrial countries and developing countries continue to grow. Energy needed to sustain life in the future world population According to the results of the model will be about 30 to 70 billion kWh per year [7].

Iran is located between parallels 25 and 40 degrees north latitude.Located in a region that has received the highest category of solar energy in the world. The amount of solar radiation between 1800 and 2200 kWh per m² per year is estimated that, of course, higher than the global average In Iran there are more than 280 days of sunshine annually have been reported to be significant. Our vast country to certain geographic locations, and with 2600 hours of sunshine annually And features a large potential for energy substrate utilization of the earth, the sun and the winds and the architectural tradition of the best countries in the world capable of taking advantage of this energy is. Unfortunately, with these resources, abundant fossil energy resources, cheap energy carriers in the country on the one hand and the high cost of new technologies for the initial investment on the other hand, a barrier the development of these technologies is emerging However, it is expected that the increase in energy prices and carriers in the near future, the use of renewable energy is feasible [1]. Iran is among the countries due to being located in the dry zone and the subtropical high pressure (STHP) In the central region, a large part of its territory is arid areas occupied by these natural factors associated with negative human interference has caused the spread of desertification. Due to limitations in areas with favorable environmental conditions that are responsible for the provision of food and given the fact that the spread of desertification threaten the region the need to improve environmental conditions in order to attract people and capital more than ever. [6]. heavily occupied by deserts humans directly, with the capability and capacity of human societies to control the use of techniques that are providing environmental bottlenecks in the relationship Knowledge of how the environment and human diversity is reflected in its efforts significantly. Primarily in arid and semi-arid conditions, especially in deserts, with the ability to detect the environment and existing constraints, it would be possible to optimize utilization [8].

The use of alternative energy in sun-rich countries in the region such as Iran could lead to long term strategies for environmental protection. Policy statements in support of expanding the utilization of renewable energy available in the Middle East with a focus on ecology and infrastructure, an option the emphasis should be in the form of the effective ways to support its expansion in the Middle East. In this way Iran as a member of the international community as well as members of various environmental treaties (such as the United Nations Framework Convention on Climate Change) the task of developing and implementing programs for efficient use of energy resources and alternative Emissions energy environment environmentally responsible is consistent with the energy [10].

Including applications of solar energy can be non-stationary power generation applications, such as water heaters, solar shower, solar heating and cooling, solar desalination, solar dryers, solar cookers, solar ovens, solar home and named [9].

III. Materials and Methods

The most important factor to evaluate the use of solar energy in general and solar energy received at each location Information and statistics about the amount of solar radiation at that location Statistics relating to the measurement of solar radiation measured at weather stations usually one or two stations in the Spot region Therefore, to estimate the amount of solar radiation in different places about the amount of solar energy received during the day. For this purpose, statistical data related to the amount of solar energy received at 5 in the desert regions of Iran Meteorological Organization during the period of 10 years (2001-2010) has been received and then Data analysis was performed using Excel software City names and their positions were presented in Table 1 and Fig.

Table 1. Geographical characteristics of the studied synoptic stations

altitude	latitude	longitude	Name of station
1550.4	32 37	40 51	Esfahan
1488	29 36	32 52	Shiraz
1370	28 29	53 60	Zahedan
1753.8	15 30	56 58	Kerman
1330.2	31 54	17 54	Yazd

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Figure 1 the studied stations positions

Instruments for measuring solar radiation

The most common device for measuring the sun's energy on earth is Shydsnj. The device for measuring the intensity of a hemispherical field of view is used. While these devices are sensitive photon detector in a completely transparent glass hemispherical coverage is adequate. Other device to measure radiation pyrometry is directly on the screen perpendicular to the radiation beam is used [11].

IV. RESULTS AND DISCUSSION

Because of the Sun Belt is one of the countries in the world, so that the radiation power is desirable. On the otherhand, Iran is a mountainous country with an average of 1,000 meters above sea level Due to the proven the higher the altitude, the more we find the more solar radiation, Iran has the potential of solar energy is right. The results of the analysis of the measurement data of the stations (ZABIH, Yousefali and colleagues show that Iran can be found in terms of solar radiation annually, divided into four sub-regions:

1. Area with a possibility of up to 40% of solar heating
2. Areas with a possibility of up to 50% of solar heating
3. of the possibility of between 50% to 70% of solar heating
4. Area with the possibility of more than 70% of solar heating.

Areas studied in this paper based on the results of the form (2), group 4 (70%) placed.

Table 2 summarizes the statistical average sunshine hours per month during the 10 years (1389-1380) and Table (3) Average daily sunshine hours during the statistical period of 10 years (2001-2010), in 5 cities shows.

Figure 3 Mean monthly sunshine hours during the statistical period of 10 years (1389-1380) and Figure (4) Average daily sunshine hours during the statistical period of 10 years (2001-2010), in 5 cities shows.

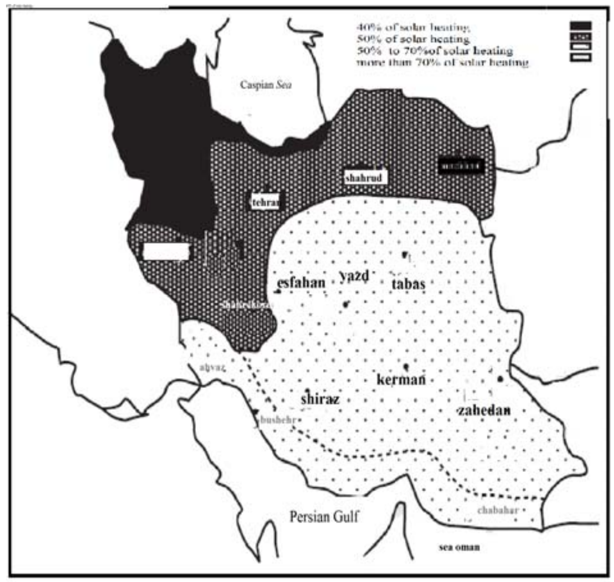

Fig 2. Iran Map of the terms of the possibility of solar heating

Table 2. Average monthly hours of sunshine synoptic stations of 10 years (2001-2010)

Zahedan	Shiraz	Yazd	Kerman	Esfahan	city month
8.6	9	8.5	8.6	8.4	April
10.6	10.6	11.1	10.3	10.5	May
11.5	11	11.7	10.9	11.8	June
11.7	11.5	11.4	11.8	11.7	July
11.7	11.5	11.3	11.6	11.9	August
10.7	10.6	10.6	10.8	10.7	September
9.9	10.2	10	10.2	9.5	October
7.9	8.5	8	8.3	7.4	November
7	6.6	7.2	7.3	6.4	December
7.1	7.2	7.3	7.1	7	January
7.3	7.5	6.9	6.9	7.5	Febuary
8.6	8.6	8.6	8.8	8.7	March
112.6	112.8	112.8	112.5	111.3	Annual

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Table 3. Average daily sunshine hour's synoptic stations for 10 years (2001-2010)

Zahedan	Shiraz	Yazd	Kerman	Esfahan	city / month
270.2	256	256.4	259.3	251.6	April
318	334.3	318.8	309.9	316	May
330	351	345.6	325.6	355.3	June
345	342.4	351.8	352.7	349.6	July
344	338	352.3	348	356	August
318.5	317.3	321	322.6	321.3	September
305.7	302.1	297.3	304.5	283.2	October
255.7	239.3	236.3	248.1	220.6	November
197.9	216.5	208.5	219.5	190.9	December
215.3	220.1	213	213.7	209.7	January
225.9	207.8	219.4	208.1	224.66	February
258.6	257.8	258.4	264.1	259.9	March
3383.9	3382.7	3378.8	3367.1	3338.8	Annual

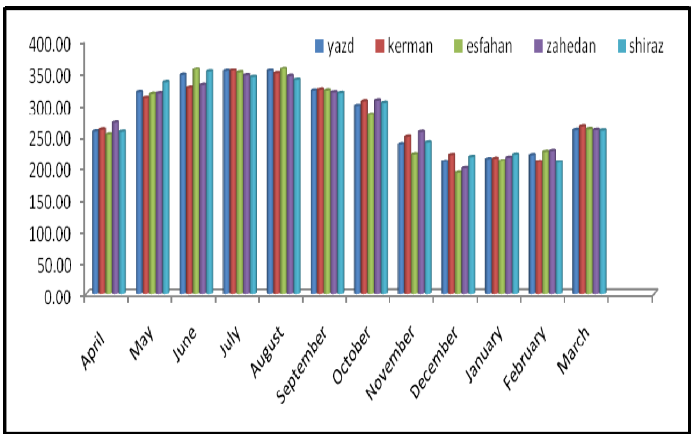

Fig 3. Mean monthly sunshine hour's synoptic stations during the past 10 years (2001-2010)

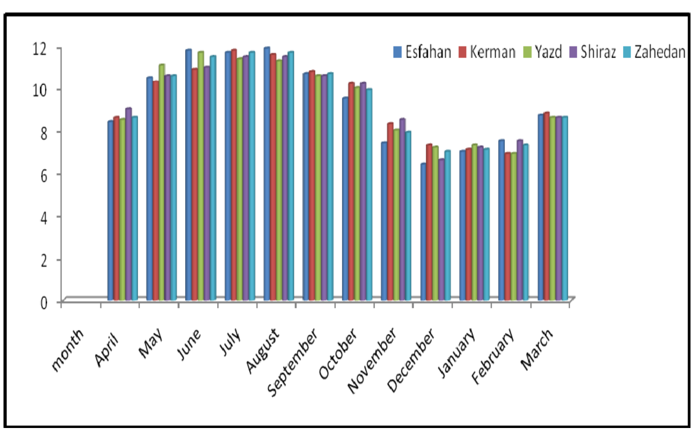

Figure 4. Average daily sunshine hour's synoptic stations during the past 10 years (2001-2010)

With regard to Iran and the geographical location of the desert is a vast desert cities such as Yazd, Shiraz, Isfahan, Kerman and Zahedan in Iran deserts are located. According to Figure 2, between their country of sun exposure is considered one of the rich countries and many cities are located in high radiation area, the desert areas of Iran in the body Based on the results from Tables 2 and 3 and Figures 3 and 4 cities studied have maximum energy received from the sun In June and July so that the amount of energy received either daily or monthly, reaches its peak And reaches its lowest in December and January. Between cities in terms of hours of solar energy is not much difference between hourly and less than 20 hours. In late spring to mid-summer can be the best use of solar energy in the region.

Further analysis of the above data and related charts show. The desert areas of potential for the use of solar radiation is Therefore, the reduction of environmental pollution and saving fossil fuels, solar radiation instead of these fuels is Therefore, a long-term planning and cost too much to design And manufacturing of solar panels and solar energy in the wind farm.

Especially in terms of using the sun as solar heating is important. The major problem in desert areas and irregular rainfall and lack of rainfall is the last person to have this problem partly subterranean technique And also by the traditional architecture (passive cooling systems such as wind towers) in cities such as Yazd and Kerman somewhat tolerable temperature in this area is Yet despite the hardships suffered in this life in the desert areas and areas with strong potential for renewable energies like solar energy. By new government policies and new approaches to renewable energy can be used to produce energy from these very favorable. The use of solar energy in building solar power plants for electricity production and consumption in the domestic sector, such as solar water heaters and Will help in reducing the consumption of fossil fuels and reduce environmental pollution caused by the burning of fossil fuels and reduce greenhouse gases.

V. Resources

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Investigation of New Packaged Biological Wastewater Treatment in laboratory and Industrial Scale

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***Abstract*—**The earth with its limited sources of the air, water and the land is the only habitat of human and other creatures. Saving these blessings is necessary to survive the human race. The development of science and efforts to provide the comfort and survival caused changes in environment and non recoverable damages to the environment and all animals. One of the damaging factors of environment is the sewage made by humans activities.

The final purpose of the wastewater treatment is saving the environment in a way which is match with the principals of public health and the economic, social, and political situation. Because of the sewage gathered from the villages and the cities would be returned to the earth and the water sources, saving the environment should be considered. On the other hand the way of settlement which is usual in most of the refineries has some problems, like needing the high budget for investigation and big land to establish. As a result in recent years the usage of new wastewater treatment packages increased, especially for the small societies.

In this project the efficiency of the wastewater treatment packages for the settlement of the city's sewage and its advantages in compared with the usual way of city sewage settlement will scrutiny. After that, the most common way of settlement used in such packages will explain. And at last the wastewater treatment package of the Kashi Marjan factory which is use for the settlement of the Sanitation for the employees of the factory to test and the interred sewage was sampled. The test of the chemically Oxygen demand and the pH test (based on the standard instruction of the environment organization) done on the sample. Due to the fact that the enough reduction of the oxygen needed of the sewage chemical which came out of the package the efficiency of the statement of the factories sewage to use for agriculture proved and now this water use to irrigating around the factory.

***Keywords*—**activated sludge clinging to the growing fusion, a small community wastewater treatment,moving bed bioreactor, Package sewage treatment plant

I. Introduction

ALL societies have produced solid waste material due to their daily activities which is commonly called swage that its control is a necessity. Sewage is basically the water consumed by the society which has been contaminated because of different applications. In terms of production sources, swage is originated from residential, official, business and industrial areas and mixed with underground and surface water.

The main and ultimate goal of swage purification has been preservation of environment in a way that concurs with the public health principles and socioeconomic issues. Since collected sewage from rural and urban societies eventually returns to soil and water recourses therefore failing to collect and purify sewage properly results in creating undesirable and harmful environmental phenomena which can put man's life in jeopardy since the spread of various intestinal and parasitic disease is resulting from inappropriate sewage disposal into surface water and its penetration into underground water in many parts of Iran. That is why application novel biologic purification package to purify effluent and reduce the amount of COD, capability of out-coming effluent consumption from the package in agricultural fields, being economical and reduction of producing and spreading stink in vicinity of the package are the issues to be dealt with in this article.

II. Theory and review of literature

Hygienic sewages are dilute solutions that 99 percent of that is made up of water and 1 percent consists of solid material and in this 1 percent, about 30 percent accounts for mineral matter, and 70 percent accounts for organic matter. Organic matter solution in urban sewage mostly is composed of protein (40 to 60 percent), carbohydrate (25 to 50 percent) and lipids and fats (10 percent). Proteins are fundamentally amino acid while carbohydrates include sugar, starch, and cellulose. Lipids include fat, oil, and grease that all of these materials possess

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carbon and are biodegradable. It is noteworthy that in addition to carbon, proteins have nitrogen [1].

A. Types of sewages

Basically sewages are divided into three categories of home swage, industrial sewage, and superficial sewage that will be explained below.

B. Characteristicsof sewage

Characteristics of sewages include all physical, chemical, and biological features that physical features are : entire solid material, smell, temperature, density, hue, degree of acid and chemical characteristic including biochemical required oxygen (BOD), the total amount of organic carbon (TOC) existed in effluent, nonorganic materials and gases and biologic features include biologically purifying microorganisms, disease-producing and contamination index microorganisms [1].

C. Categorization and purification method

Purification methods include physical methods and processes, chemical methods and processes and biologic methods and processes which will be explained further.

1. Physical methods and processes: the purification methods in which applying physical forces are dominant are named physical processes and were the first method utilized in sewage purification like: removing garbage, removing seeds, sedimentation, fluid-making, and flattening.

2. Chemical methods and processes: the purification methods in which removing or pollutants transformation due to addition of chemical material or resulting from chemical reaction occurs are termed chemical processes. Superficial absorbing and sterilization are the most common examples of chemical processes used in sewage purification.

3. Biological methods and processes: purification methods in which pollutant removing is conducted through biologic activities are called biological processes.

In first place, these methods are used to remove biodegradable organic materials in form of solution and cloyed from sewage so that these organic materials transform into cell mass that can be removed with sewage sedimentation or turn into carbon dioxide and other gasses and inject into air [2].

Various types of biological purification processes include aerobic processes, non-aerobic processes, suspension development processes, attached development processes, nitrification and de-nitrification processes.

Different types of biological purification:

1. Stabilization ponds: is one unit of purification in which sewage is preserved for a specified period of time under the effect of microorganism and nature's forces until effluent is disposable and recyclable.

2. Activated sludge: the process of activated sludge is a biological-aerobic and suspension development purification method. This method which is usually regarded as a secondary purification process, after the primary sedimentation and because in this activated mass process is produced from microorganism is able to stabilize waste that is called sludge process and figure 1 below illustrated one example of it.

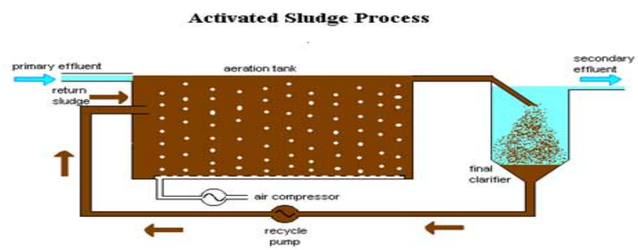

Fig. 1 Schematic of activated sludge

3. Stalactite filter: to purify sewage biologically in small towns and cities with a population of approximately 50,000 people stalactite purification can be used. This filter is a biological-aerobic and attached purification method made up of concrete or metal cylinders with stone bed and usually in circular shape and inside there are pebbles or plastic materials which technically are called filter area or media and sewage is scattered on it [3].

4. Sequencing batch reactor: the difference of this system with the commonly used methods in purification is that this system interacts with time instead of space. In fact this system with a temporal sequencing control is able to perform operations such as balancing, biological purification, and clarification in a pond [4].

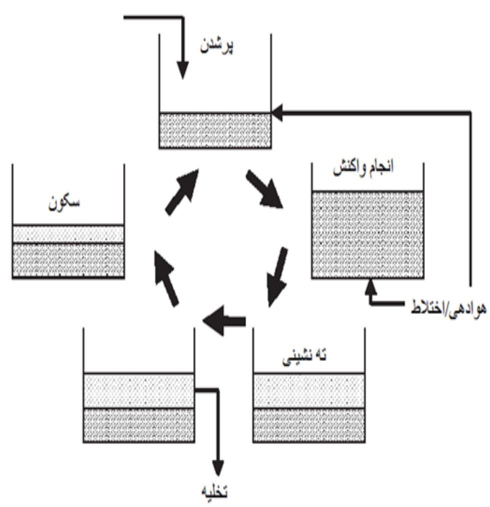

Fig. 2 Schematic of SBR Reactor

D. Some biological package present in sewage purification

1. Package of sewage purification through activated sludge along with integrated attached development: including two processes of suspension development and attached development, using fixed floors inside activated sludge reactor. In process of activated sludge with integrated attached development the processes of attached development and

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microbial suspend utilized simultaneously. The process of activated sludge with integrated attached development consists of two main parts of suspended and attached biomass. Suspended biomass is shaped through sludge returning from secondary sedimentation pond into ventilator pond and attached biomass is formed through microorganism's development on media [5].

2. Package of sewage purification with the process of non-aerobic sludge layer and upward current: non-aerobic purification is the best method for the purification of organic sewage with high contamination (such as food industry , Yeast production, chemical sewage and sewages resulting from pharmaceutical industry) .

The main idea of applying non-aerobic purification method is using bacteria which are able to disintegrate organic materials without oxygen consumption and carbon dioxide and methane production without problems and issues pertinent to oxygen transfer, sedimentation and production of biological sludge. The main characteristic of this system is that enables us to apply sewage with a very higher load of COD compared with other non-aerobic processes, and sludge production in this system is in form of granule [6].

3. Sewage purification package through membrane bioreactor: today one of the advanced method in sewage purification membrane one (MBR) is in which microbe removing id done through membrane. With the installation of these membranes in biological reactor, we don not need sedimentation and filtration parts and these membranes are responsible for removing purified sewage from sludge. Utilizing membrane makes sewage purification possible in small space and with efficiency in such a way that the quality of purified sewage is better than standards of sewage for draining of superficial water [7].

4. Sewage purification packages through the biological spinning discus: another method in form of pre-made sewage purification package, is using attached development system in which existing microorganism in sewage consume nutrients in sewage by forming a gelatin layer on solid leg such as pebble or plastic filler existing in filter stalactite or spinning discus in spinning biological discus.

In this method oxygen in air with a mechanism of penetration into gelatin layer penetrates and bacteria grow by consuming nutrients and salt and as a result, the thickness of gelatin layer increases gradually until enough oxygen does not reach into the middle layers. Middle layers are deprived of oxygen and become non-aerobic. The result of non-aerobic condition is weakness of layer and separation from surface through the shear stress resulting from fluid current.

5. Sewage purification package of bio-film reactor with a mobile floor: MBBR system uses acnes which are fluid in ventilator tank. Bio-film or microbial layer grows on floating acnes and in this way multiple floating biomasses in sewage surrounding which has the role of disintegration of organic materials. This method is very desirable to remove BOD, COD, and nitrogen.

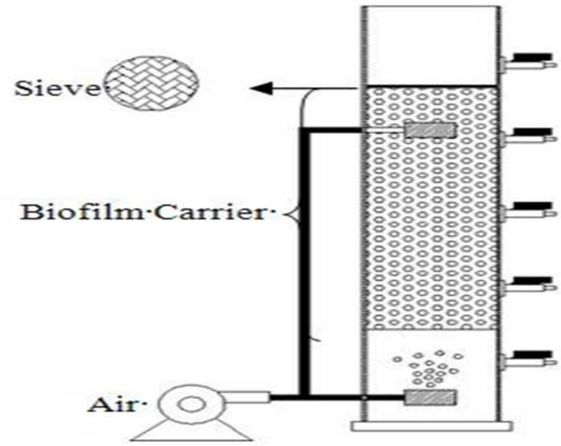

Fig. 3 Schematic of a package MBBR

III. MATERIALS AND METHODS

Our experiment was conducted through MBBR reactor in which we used the acnes made up of polyethylene from KMT company. Also spinning of acnes in the reactor was possible through the ventilation by air compressor from the bottom of the reactor. In order to preserve acnes in the reactor, we made a net-like plate in the exit of reactor. The percentage of acnes being filled in reactor is important because of amount of bio-copper which can be preserved by acnes. The reactor was exploited at 22.5 to 23 degrees. In order to run the pilot reactor we used returning sludge. The reactor was filled with 30 percent of the volume of this sludge and then in sampled sewage reactor from the company's purified package we calculated with COD, poured and the reactor ventilation was commenced. We treated the reactor constantly to prepare the system for operation. This stage took one day. After this stage, and concordance of microorganism with the current condition, after two days, we calculated the percentage of eliminated COD from the effluent sample taken from exit of reactor and was written. It is noteworthy that we took the incoming sample after passing the fat retention and septic tank (non-aerobic reservoir covered with hydrolic time for five days) present in factory which approaches pumping package and goes into the tank. In this experiment, we dealt with two factors of Shelf life and amount of ventilation.

A. Experiment method

In order to decide COD of effluent, we used returning distillation method. Most of the organic materials are destroyed as a result of boiling with mixture of chromic acid and sulfuric acid. The sample in a strong acid solution with a specified amount of dichromate potassium becomes returning digest. After the digestion, the remaining of the not restored dichromate with double sulfite of aluminum and iron titrated so that we could determine the amount of consumed dichromate. In the end, the amount of oxidized organic material is calculated as exchange oxygen.

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acid, ferion, the standard solution of fro ammonium sulfate 0.25 normal, mercury sulfate, and fenalat hydrogen potassium agents. To experiment COD we need witness sample and an effluent sample which in witness sample we use distilled water instead of sewage. Since our experimented sample of effluent is a human effluent we do not need to dilute it. Dilution is recommended for the industrial and highly concentrated effluent. We calculate the amount of ph with HORIBA ph meter and glass electrode. It is noteworthy that ph should be read as sample is taken. It means that we cannot carry it to the laboratory. In this stage we pour the sufficient amount of the sample into 100ml pipe and soaked with the electrode, then let the device be stable for two minutes, when the number is constant on the device, we will read the sample ph on the screen.

We put a sample of incoming effluent with COD = 347 and ph=9.5 into the reactor and take sample of exit of reactor for 19 times that the results are illustrated in figures 4 and 5.

Then we reduce the condition of ventilation of package from 3 to 4 mg in 1 liter to 2 mg in 1 liter and examine a sample of human effluent as the same mentioned condition with COD= 312 mg in 1 liter. And then the findings and comparison between the first and the second test on examining the effect of amount of ventilation parameter are given in figures 6 and 7.

IV. FINDINGS AND DISCUSSION

The first test examines the parameter of duration of Shelf life and the results below from data and with the figures obtained:

In regard to the resulted amount, we can infere :

1. After approximately 12 days the strength of elimination of COD continues with a gradual slope.
2. After 30 days the amount of elimination of COD stabilized and does not change.
3. The efficiency of the above package for the human effluent was normal while regarding the studies and researches of scientists, the efficiency of this type of industrial effluent is very high and has 98 and 99 percent of efficiency.
4. The incoming ph changes does not change the efficiency of the package.

The second test examined the ventilation parameter and the findings below were obtained:

1. Regarding figure 4 and while the amount of COD of the incoming effluent of the second test is less than the first effluent, we witnessed that after three stages the amount of COD in exit effluent of the first test is less than the second one.
2. Regarding figure3, we saw that the difference of efficiency of COD elimination in exit effluent of the sample 3 is more than no.2 and no.2 is more than no.1

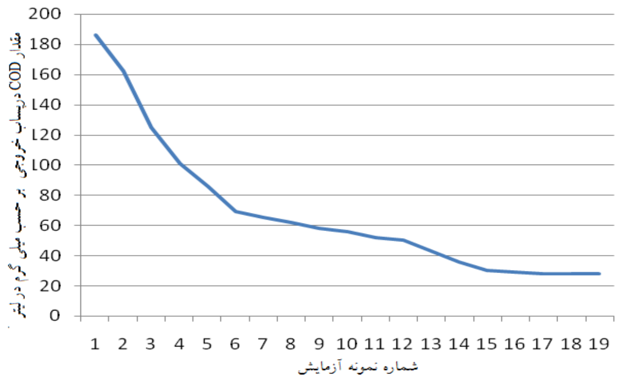

Fig. 4 COD removal in the first experiment

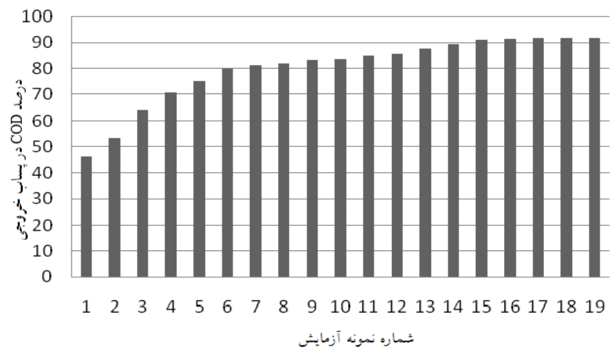

Fig. 5 Of the effluent COD in the first experiment

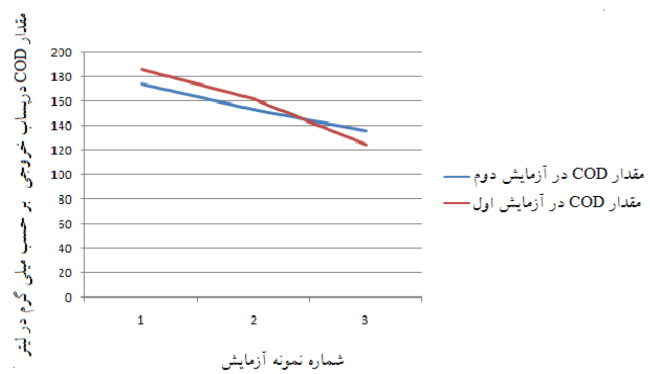

Fig. 6 Compares the amount of effluent COD removal tests

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Fig. 7 Compares the effluent COD removal efficiencies of the two tests

A. Conclusion

Since the human effluent (sanitation) is usually fixed in a society (they don not undergo major changes) so we can generalize these findings to other urban societies. The examination and function of package and the amount of lab data indicate:

1. We should be careful with opting for the acnes which would have the more special surface so that it makes the growth of bio-film more possible.
2. Whenever for any reasons we do not have one of the parameters of COD elimination, with the help of improving other parameters, the condition for COD elimination can be provided.
3. With the change and optimizing the parameters for COD elimination, we can raise the efficiency of the COD elimination in exit effluent.
4. These packages do not need to be washed continuously due to lack of mass production of sludge and good ventilation and the cost of its maintenance is low.
5. This system compared to other systems such as activated sludge and etc. due to characteristics like easy and simple design low operational cost and high efficiency of COD elimination is a good suggestion for purification of different types of sewage particularly industrial sewage and industrial town.
6. Regarding the national standard of environment of Iran that the amount of exit COD for releasing into superficial water and rivers, asserted figure 60mg/lit, efficiency of the package is good.(for the agricultural consumptions this number should be less than 200).
7. We can use this package in different temporal areas of warm and dry, cold and mild areas.
8. Application of these packages causes acceptable reduction of required chemical oxygen.
9. The exit effluent from the above package can be used in agricultural and irrigation consumption.
10. With the increase of acnes, we can increase the capacity of purification.

V. Suggestions

- Since the use of polyethylene acnes which are not produced in the country and is expensive, with consideration of economy, we use LIKA pebbles in availability and possessing specific high level.
- Regarding type of used acne, we can multiple acnes to reach a more desired conclusion.
- In opting for acnes, we should consider that acne is chosen that has a more particular surface so that the possibility of the growth of bio-film is more.
- Since the temperature in the reactor is about 23 degrees, with the temporal change (indeed about 5 centigrade degrees) the amount of efficiency of COD elimination might change.

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New technologies for photovoltaic systems

Alireza Babaei Jondabeh

***Abstract*—** Solar cell technology is classified into three generations. In this paper, an overview of the technology, photovoltaic systems, photovoltaic technologies described first and second generation and third generation photovoltaic systems deal with the latest developments. Based solar cells, organic solar cells by concentrated photovoltaic technology, and in particular progress regarding the use of solar cells based on quantum dots include Schottky solar cell transplantation depleted heterogeneous, extremely thin absorber, links heterogeneous mass (polymer) cells sensitized with quantum dots is discussed.

***Keywords*—** Solar cells, photovoltaic systems, quantum dots, nanostructures.

I. Introduction

MORE atoms of the Sun, like most stars, are chemical element of hydrogen atoms. After hydrogen, helium element found in the sun and the mass of the sun is composed of atoms of other seven elements.

In every second, in the sun about 6×10^{11} Kg of hydrogen, with a net mass loss 4×10^{3} Kg, is converted into helium. It converted into 3.6×10^{20} J of energy through the Einstein equation ($E = mc^2$).

Basically this energy is a form of electromagnetic radiation in the ultraviolet area to infrared. Due to reflection, scattering and absorption by gases and aerosols in the atmosphere, only 47% of this energy reaches the earth's surface.Although the sun provides the energy which is needed for the inhabitants of the earth 10,000 times a day [8]. Today, solar electricity is about 0.1 Percentage of consumption [2].

In Iran, with almost 300 Sunny days a year in more than two-thirds of areas and an average radiation of 5.5 to 4.5 kWh per square meter in a day, it is among the best in the world in the field of solar energy potential.

According to international standards, if the average daily solar radiation energy be higher than 3.5 kWh per square meter, the use of some solar models such as photovoltaic systems are very economical and affordable.

II. Photovoltaic Systems

Exploration of the effects of photovoltaic (pv) back to 1839, but Development and application of it is slow.

In 1954, Chapin and his colleagues at Bell Laboratories invented silicon solar cells with an efficiency of 6% [3].

In last 1950, solar cells were used to supply electrical power of satellite systems, because these Components required no maintenance for a long period and they were very useful with no large drop in conversion efficiency.

In 1970s, scientists discovered that the photovoltaic effect can be a viable proposition for energy through non-fossil sources [1].

In fact, these cells must be designed to convert wavelengths of sunlight that reaches the Earth's surface with high efficiency, into useful energy.

III. The First Generation of Photovoltaic Systems Technologies: Crystalline Cells

At present, Silicon is one of the most abundant elements on Earth. This element is a semiconductor and suitable for use in photovoltaic systems.

The most common tumor material for solar cells is crystalline silicon (c-Si). Crystalline silicon cells, depending on how silicon wafers are made, divided into two general categories: Single-crystal silicon (sc-Si) and polycrystalline silicon (pc-Si) or multi-crystalline (mc-Si).

The best efficiency of mono-crystalline solar cells in standard laboratory conditions was 24.7%, and the approved efficiency for these cells was about 20-24% and for polycrystalline cells was measured 14-18 percent.

Maximum efficiency of approved photovoltaic modules is 23% for single-crystal silicon, and 16% for polycrystalline silicon.

IV. The Second Generation of Photovoltaic Systems Technologies: GaAs Thin Film Solar Cells

The first condition for material used in a piece of photovoltaic solar energy converters, is matching the energy gap with solar spectrum, high mobility and lifetime of high carriers.The situation for many compounds are met II-VI, III-V and Si.

Materials Group III - V, with great success used in space applications where cost is not a major factor despite the high cost of extraction and manufacture of semiconductors.

In 1961, Shockley and Queisser by considering solar cell transplantation as a black body with a temperature of 300 K showed that the maximum efficiency of a solar cell, regardless of the type of technology used in it, is (30%).it obtained for the cells with the energy gap of 1.39 eV.

Since the energy gap of arsenide gallium is equal to 1.424 eV, it can be a material for solar cells design. The solar cells

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fabricated based on thin film of GaAs- are also named as a second generation of solar cells (Figure 1).

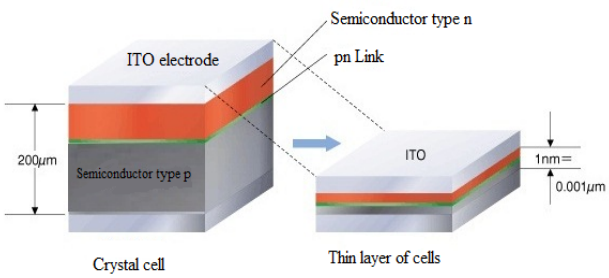

Fig. 1 Comparison of the thickness of silicone Required in thin film and crystalline cells.

After 20 years of research and development, the use of thin film solar cells began to spread. Three main types of thin film solar cells ,that already have commercial usage, are amorphous silicon's cells (a-Si) and (a-Si / μc-Si), cadmium telluride cells (Cd-Te) and the cells of copper, indium, selenide (CIS) and copper, indium, gallium, selenide (CIGS).

Maximum efficiency of photovoltaic modules is 7.1, 11.2 and 12.1 percent respectively which is approved for amorphous silicon, cadmium telluride, and CIS / CIGS [10].

V. The Third Generation of Photovoltaic Systems Technologies

The maximum electrical power conversion efficiency of a single bond PV cell in the first or second generation ,which is called "Shockley- Queisser "level is equal to 33.7 percent.

One of the main goals of the third-generation solar cells is to reach a higher level of Shockley- Queisser. This purpose of the third generation of solar cells is achieved by using multiple connections.

The technologies of this generation live on pre-commercialization stage .Third generation technologies include: solar cells based on organic materials, solar cells with concentrator photovoltaic technology and solar cells based on quantum dots. In this article, we'll consider these items.

VI. Solar Cells Based on Organic Materials

Solar cells made from organic materials have much lower efficiency in comparison with other solar cell. However, due to the low cost and some features such as flexibility, they are appropriate for non-industrial uses.

Types of solar cells are based on organic materials, including Dye-sensitized solar cells, polymer solar cells and solar cells based on liquid crystals which we describe each of them.

A. Dye-sensitized solar cells (DSSC)

The basic structure of a DSSC is to enter a transparent n-type semiconductor (with a wide energy gap) in a network of Nano scale columns in contact with Nano-particles or coral-shaped ridges optimally. (Figure 2)

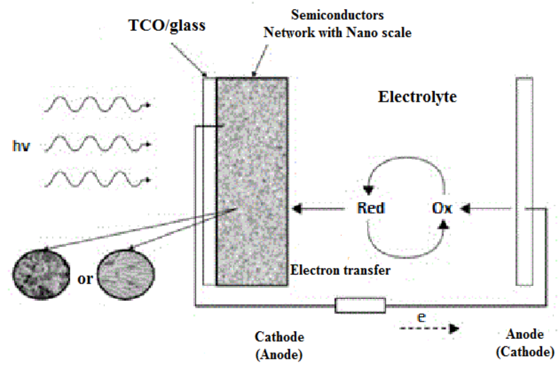

Fig. 2 The schematic of Dye-sensitized solar cells.

The level of network is designed great and every part covered with a single layer of a color or a coating of quantum dots, which act as color. Then, an electrolyte is used to penetrate the coated network structure to create a channel or passage between the color and the Anode.

Dye absorbs light and it produce Aksaytun, in which semiconductor is separated at the interface colors and leads to electrons By photons for semiconductor and oxidized dye molecules by the electrolyte (which must be reduced and reproduce) [13].

B. Polymer solar cells(OPV)

Polymer solar cells have certain characteristics. Because the active ingredients used for the manufacture of parts are soluble in organic solvents, the polymer solar cells have the potential to build flexibility and functionality in a continuous printing process and similar to printing paper.

Recently, the power conversion efficiency has been reported about 6%, but this number is far from the values for common applications [19].

C. Solar cells based on liquid crystal (LCPV)

As an example of solar cells, from the columnar liquid crystal is used for manufacturing cells. A group of liquid crystals can exist in the column form. A columnar form is a condition in which the molecules forming liquid crystals, it can be likened to disc, join together and form columns (Figure 3).

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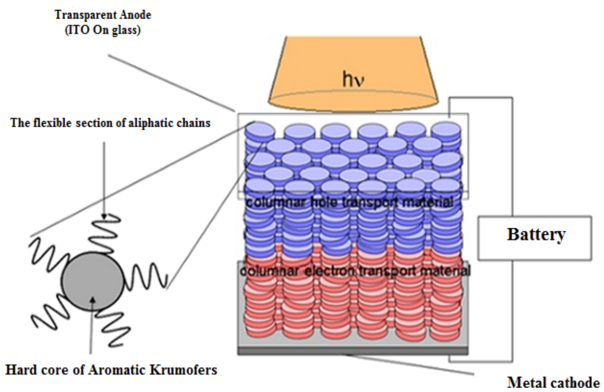

Fig. 3 The ideal structure of solar devices based liquid crystal

At first, these liquid crystals were called Liquid crystals of disc, because each column is made of stacked disc plates like molecules altogether.

Recent research has shown that some of columnar liquid crystals are made of non-disk units and As a result, it is better to be told this group of materials as columnar liquid crystals.

VII. Solar cells with concentrator photovoltaic technology(CPV)

The new generation of photovoltaic cells technology which is called concentrated photovoltaic (CPV), instead of adding and Expanding expensive photovoltaic panels to receive more energy from the sun, radiation energy received on a larger level focused on with the use of optical concentrators panels on the cells and so much more radiation is focused on each square centimeter of the surface of the cell.

Due to the significant reduction of required photovoltaic panels, in this method for producing each watt of electrical power, it is used of expensive photovoltaic cells, known as the triple junction with the energy conversion efficiency which is much higher than the normal cells.

In conclusion, despite of the higher cost of these types of cells, due to the increased efficiency up to 35% and reduction of the requirements area in compared with the photovoltaic panels on the same power; they will be cheaper and more economical.

Triple junction cells have a high technology and so far they only used in aerospace applications, now, with introducing CPV technology in energy generation, they are in competition with common photovoltaic panels.

Nowadays, another type of CPV products are manufactured and delivered by a few companies in the world and suggestion is called Dish CPV, as the name implies, action of focusing light on CPV modules is produced based on using mirrors to install on a hair shaped dish.

In this technology, because of using dish, there is no need to use expensive optical glass and specific concentrator lenses. The dish uses the same mirror with a relatively simple technology.

CPV technology will be promises a bright future in establishing high power and small-scale solar power plants. In 2013, a team of German-French from this research center introduced solar cells with an efficiency of 43.6 percent. The research activities of more compact and further optimization steps lead to new success about 44.7%.

VIII. Solar cells based on quantum dots

In fact, one of the main advantages of third generation solar cells is access to simpler techniques and methods used to build cells, the use of raw materials and inexpensive manufacturing processes in which the quantum dot solar cells can have an important role, since all manufacturing processes can be printed on.

Quantum dot is a semiconductor nanostructure in which the mobility of electrons in the conduction band limits valance band holes or Aksaytun in all three spatial directions.The ability to adjust the energy gap, a feature that makes quantum dots suitable for use in solar cells (Figure 4). In this respect, they are expensive similar to multi-layer cells, but the production cost of quantum dots is much lower [14], [16].

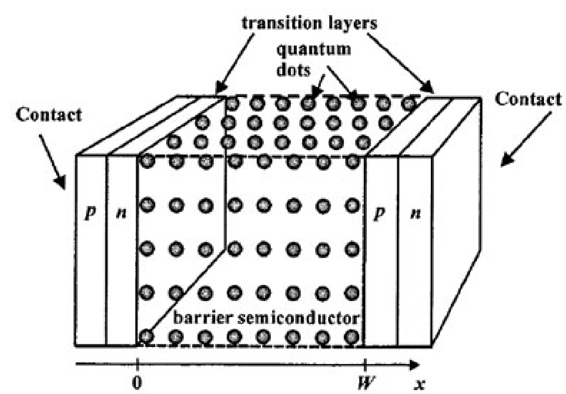

Fig. 4 Solar cells based on quantum dots.

A limiting factor for the efficiency of energy conversion in solar cells with an energy gap is that photon energy absorbed by the semiconductor energy gap is wasted as heat by the effect of Electron – photon interaction until the Carriers go through the edge of the energy band gap and in term they come to rest (Figure 5).

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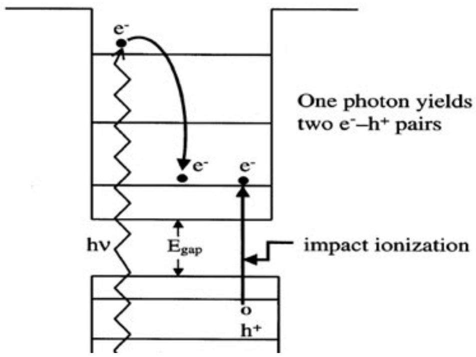

Fig. 5 Improving the efficiency of photovoltaic in Quantum dot solar cells by using impact ionization (inverse Auger effect).

In recent years, techniques for reducing these losses are presented by using quantum structures such as quantum wells and quantum dots. In these structures, when the carriers in semiconductors are limited by a potential barrier to specific areas that are smaller or comparable with the wavelength in front of them or exciting Bohr radius in a bulk semiconductor, the relaxation dynamics will be completely different[6],[12].

The following are a few examples of solar cells based on quantum dots law.

A. The Solar Cells of Schottky Quantum Dot

Schottky cells are the simplest photovoltaic device as the first structure of Quantum dot solar cell with the efficiency of 1% [2].

These cells are addressed because of some reasons.

At First, these cells can be produced by spray technique or injection print from solutions phase. Second, for making them, it requires a thin layer of Absorbing quantum dots in photovoltaic cells with a thickness of about 100 nm.

In This way, a transparent conductor oxide with relatively large work function, such as ITO, with a film of colloidal quantum dots forms an ohmic connection. Behind the device, a metal with low work function such as aluminum or magnesium creates a separator bar junction to extract electrons and holes disposal.

The Difference between the Location of the Fermi level in the metal and semiconductor, causes the charge transfer from the metal to the p-type semiconductor and in this way, the Schottky junction is formed. Most studies on Schottky solar cells are based on nano absorbents with the wavelengths of near-infrared (NIR), such Pbs, CdTe, Si and PbSe [15].

To improve the efficiency of Schottky cells, these cell types are combined with other types. A new approach of this type of compounds is a grapheme solar cells based on Schottky transplantation which are associated with adding organic matter.

The researcher achieved an output of 1.9 percent for non-doped device and after Purification, it returns to 8.6 percent [17].

B. Quantum dot solar cells with depleted heterogeneous graft

In 2010, researchers suggested a structure of colloidal quantum dot solar cells in which it remove the main limitation of Schottky cells, i.e., low internal voltages.

In general, the structure of this cell is consisting of a layer of quantum dots, which is located between the Layer of electron transfer (usually TiO_2) and a metal electrode. In fact, the conjunction between p-type quantum dots is formed on a n-type substrate such as titanium oxide (TiO_2) and zinc oxide (znO).

In this structure, the flow of electrons from TiO_2 layers is higher than the metal binding.

So they create a reversed polarity. Also, The TiO_2 is partially depleted due to low density of carriers type n ($10^{16}cm^{-3}$.)

The Advantage of solar cell with heterogeneous graft over Schottky type is that in Schottky type, the light is emitted by the nanoparticles of quantum to junction place, therefore, electrons and holes are formed on a circumference location far from connection.

However, in heterogeneous graft, the light is irradiated to the junction with a large energy gap from the n-type semiconductor material.

So, The material type n with a large energy gap, don't absorb the light, and the highest density of electrons and holes in quantum dots substrate to the junction is produced, resulting in an effective separation will take place [2] and [16].

Ohmic connections play an important role behind the cell and in particular, when colloidal quantum dots are applied with a large band gap, they require the use of an electrode with a large work function, such MnO_3, as well as it precludes the use of gold. Recently, investigators with the optimization of this structure, they have been reported the power conversion efficiency of 6%.

C. Extremely thin Quantum dot solar cells absorber (ETA)

In the past two decades, extensive studies have been done on extremely thin solar cells absorber (ETA). Based on deposition method of Absorber layer, there is Great diversity in the methods of producing ETA solar cells. The most common methods include: sequential of ion - layer and adsorption reaction (SILAR), ion layer gas reaction (ILGAR), electrical deposition, atomic layer deposition (ALD) and plasma-assisted chemical vapor deposition.

Traditionally, inorganic compounds of copper cavities conducting for example CuSCN, CuI and $CuAlO_2$ have been used in ETA solar cells.

A sample of this cells is the structure of ZnO/CdSe / CuSCN based on ZnO nanowires type n and hole conductor materials CuSCN type p.

In addition to nanowires, the semi-porous substrate of TiO_2

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may be considered as an ideal material for quantum dots. Although some experimental work is ongoing in this area, but the power conversion efficiency of these cells remained below 4%. Calculations modeled after the return of 15% cells CdTe accessible[7].

D. The Quantum dot solar cells of massive heterogeneous transplantation (polymer)

Massive Heterogeneous cell are consist of mixed polymers of Electrons and fullerenes of electron acceptors.

It is believed that in these cells the integration of semiconductor nanoparticles is associated with increased efficiency. Many different semiconductor materials in these cells have been used such as $ZrTiO_4/Bi_2O_3$, TiO_2PbSe, CdSe, CdS, ZnS, ZnO and Si.

It has been shown that the Photon conversion efficiency of polymer solar cells based on quantum dots depends on Nano crystal shape. For example, the Device consists of rod-shaped nanoparticles, yields better efficiency than Nano-particles with spherical geometry. Recently, some of these cells have been reported with maximum efficiency of power conversion up to 7.4 percent [18].

E. Quantum Dot Sensitized Solar Cells(QDSSC)

Semiconductor nanostructure films with Wide band gap, provides a microscopic level in which it is several times larger than the geometric area. This surface can be sensitized by a thin layer of absorbent with a less absorption. We can use of Nano-rods, nanowires, nanotubes, Nano sheets, etc. as a Nanostructure.

Quantum dot solar sensitized cells (QDSSC) as a third-generation photovoltaic devices Considered to be significant. These cells are a new type of dye sensitized solar cells (DSSC). The difference between QDSSC and DSSC is due to the sensitizer used to receive sunlight. In DSSC, the sensitizer is an organic dye molecule or a metal-organic compound, while in QDSSC, the sensitizer quantum dots is an inorganic semiconductor material .

Quantum dot sensitized solar cells are capable of producing extremely high photon flows due to the effect of collisional ionization in which will lead to a quantum efficiency higher than one. Today, the conversion efficiency of these cells is very low and the quantum efficiency is less than one

The low conversion efficiency of these cells is mainly due to the difficulties in making full quantum dots. The researchers believe that this issue will be resolved in the near future.

Recently, the inevitable effect of hybrid colloidal quantum dots is used in its construction of these cells in that the result is an efficiency of 7 percent [5].

IX. CONCLUSION

Photovoltaic systems are one of the most widely used of renewable energies and so far, Different systems with different capacities (0.5 kW to several MW) has been installed all around the world and Due to the reliability and performance of these systems, the number of applicants are added every day.

In this paper we introduced the first, second and third generations of photovoltaic cell technologies, and the developments of third generation solar cells were reviewed.

The Technology of solar cells based on quantum dots is highly regarded. Although the current efficiency of these cells is still lower than 10%, but with near to 10% efficiency and the use of construction techniques using multi-layer cell , we can be hope for an efficiencies above 15%.

To achieve this goal, the use of nanostructured materials with high quality and extensive research in this field is warranted.

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The Study of Noise Pollution Using Sound Maps in Desalination Unit of Karoon Oil & Gas Production Company , Ahwaz – Iran

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Abstract— **Being exposed to noise pollution is one of the most widespread type of industrial pollution endangering the health of many workers. The study was conducted on three generating sources of noise pollution and 51 effective points. The type of studies is descriptive –analytical aiming at determining generator sources in making noise pollution , providing colorful Contours and isosonic curves in order to determine the current condition of noise pollution and to make appropriate policies for lowering of noise pollution effectively in the future. By using $SURFER_{10}$ & ARC GIS_{10} software , safe and unsafe places were identified .**

***Keywords*— Noise pollution ,Oil & Gas desalination unit , Sound maps**

I. INTRODUCTION

Unwanted and annoying sound (Noise) not only is a threating factor for mental and physical health but also has harmful economic - social consequences [4]. The productions reduction due to the low work attention and much fatigue during the work as the result of insufficient rest , increased treatment costs due to little sleep and damaged hearing systems, loss of mental and spiritual relax and descended work quality are only a part of impacts and consequences of noise pollution [5]. So far , a great deal of research has been done concerning the study of noise pollution in different industries from the perspective of occupational health and personnel protection . Due to existing various noisy sources , noise pollution is one of the environmental and health problems in desalination unit causing health damage of the personnel in this factory, especially when several noise generating sources work together and consequently the noise pollution will be intensified. In this study, the objectives such as identifying different noise generating sources, providing sound maps, Geographical Information System (GIS) maps and Isosonic curves (Isograms) are followed in order to specify safe and unsafe areas and to make appropriate policies for controlling and managing noise pollution more effectively in the future.

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II. PROCEDURE

The place of performing this descriptive – analytical study is one of oil & gas desalination factories located in the south of Iran.

In the first phase of this research , a field observation was made in order to identify and determine noise pollution generating sources in under study factory and before conducting any practical activity , sound level meter apparatus was calibrated. Sound level meter apparatus was of CEL-450 type and together with CEL-110/2 calibrator made by England.

In the second, in order to determine the rate of noise pollution, to provide colorful counters and to draw isosonic curves , the measurement was made according to standard method ISO 9612 (1997) . Implementing this method requires using a regular network measuring method in which firstly a dedicated plan of the factory was prepared and then the stations under study networked into equal squares (10×10 m^2) using a stripped meter because the area of the factory under study was more than $1000m^2$ with large acoustic sources.

Then, the center of each square was targeted as measuring points. In cases on which the center of square was placed on the apparatus and / or on the devices , that square omitted and removed from the total measuring points as a blind point.

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Since the noise arisen from the identified generating sources in this factory was of the continuous type , at each point at least the sound level metering was measured three times at time interval of 15s and the mean of all three readings considered as the sound pressure level at each point. With respect to the objective of research including determining caution and danger zones in the factory , under measuring scale of noise on network A, the speed of the apparatus response at SLOW mode and the position of sound pressure level at Root Mean Square (RMS) was selected. After measuring , the data of sound pressure level was introduced to ARC GIS10 software in order to provide GIS maps according to the American Conference of Government Industrial Hygienists (ACGIH) and Iranian occupational health committee as well as to provide sound maps and isosonic curves (isograms), the data was introduced to Surfer10 and the sound map at each station dyed according to American National Standards Institute (ANCI) including :

1. Safe zone : The noise is lower than the allowed safety limit 70 dB (A) and is in green on sound maps.
2. Hygiene zone : The noise range is 70 – 80 dB (A) and is in blue on sound maps.
3. Warning zone : The noise range is 85 - 90 dB (A) and is in yellow on sound maps.
4. Danger zone : The noise in these areas is higher than 90 dB (A) and is in red on sound maps.

III. FINDINGS OF RESEARCH

Three noise generating sources located in three stations at 51 points were sound level metered so that the results of acoustic parameters (maximum , minimum and the mean sound pressure level) at any station are as the following:

Table I :

Table I. Minimum , Maximum , and the Mean sound pressure level at each station of desalination factory

Percent of stations on danger range	Number of points on danger range	Mean sound pressure level dB(A)	Maximum sound pressure level dB(A)	Minimum sound pressure level dB(A)	Main apparatuses of noise generating	station	Factory
60%	3	84.87	87.3	75.7	Electro-motor	The area of Electro-motors injecting the water	Desalination factory
69.2%	9	89.12	95.8	82.5	Pump station	Oil pumps of Asemari	
60%	3	86.68	88.4	82.1		Pump stations of the returned water	
60%	3	88.79	95.6	81.8		Pump stations of additional water	
100%	10	91.28	95.4	78.6		Bangestan pump stations	
100%	6	95.91	100.8	91.2	compressor	Air compressors area	

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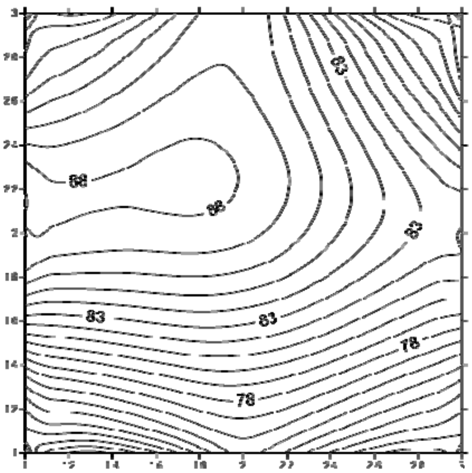
I. Colorful Contour , Isosonic Curves , and GIS Acoustic Safe and Unsafe Zones of Each Source Generating Noise Pollution

A. Electro-motors area in desalination factory



Map I. Isosonic map of electro-motors area

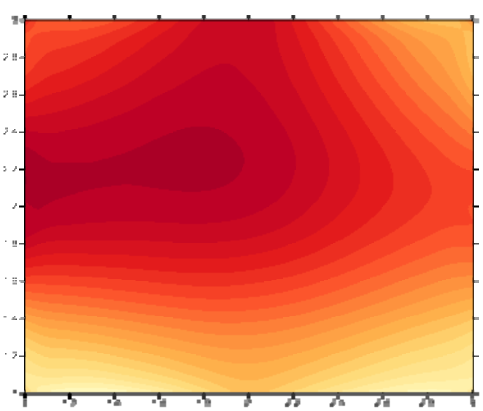
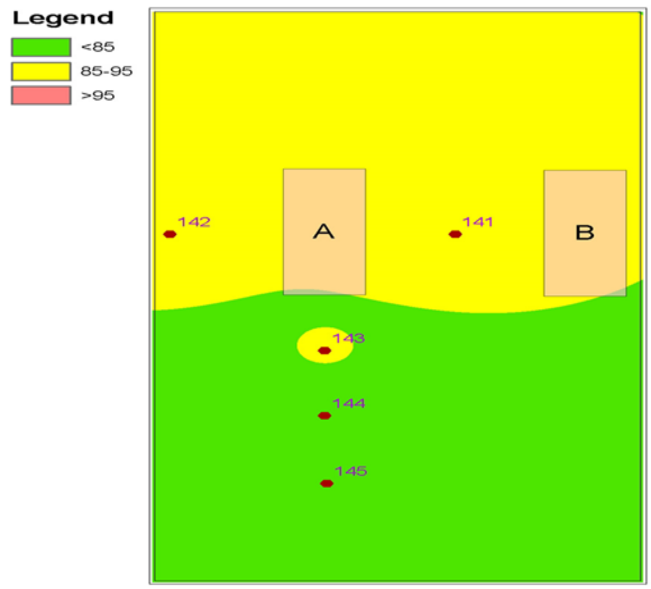


Fig.I Sound map of electro-motors area

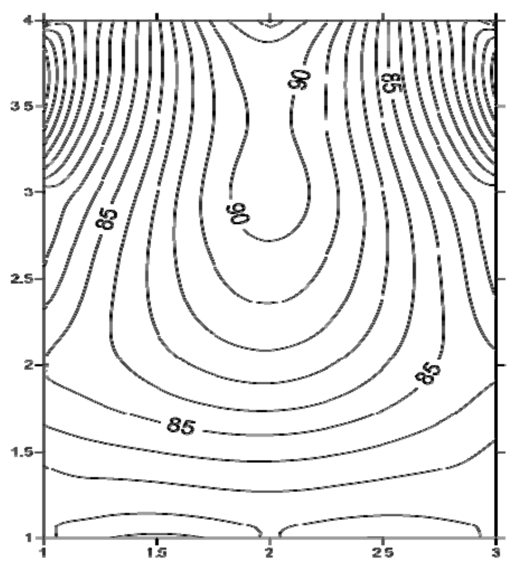
Fig.I shows that there is maximum sound pressure level around ON pump.



Map II. Gis map of electro-motors area (safe zone and sound pollution caution zone)

Map II. Shows that the zone of two compressors is located in caution area and their external space in safe area. In addition , the zone of sound pressure 85 dB (A) is located in caution area.

B. Pumps area in desalination factory



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Map III. Isosonic map of pumps area

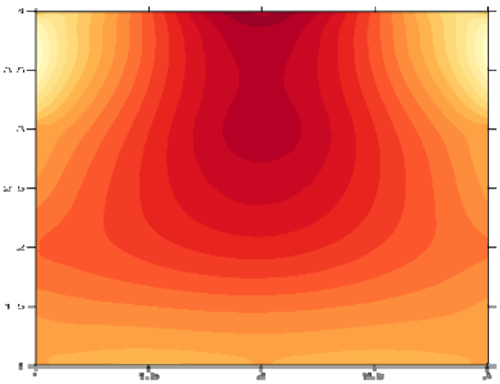
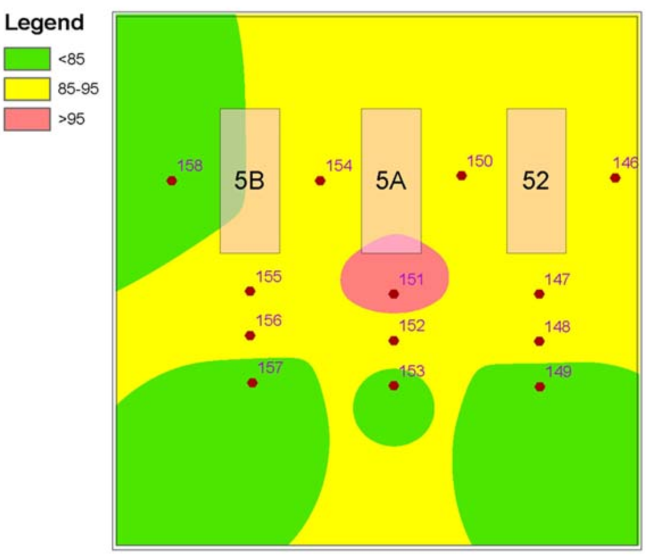


Fig.II Colorful countor of pumps area

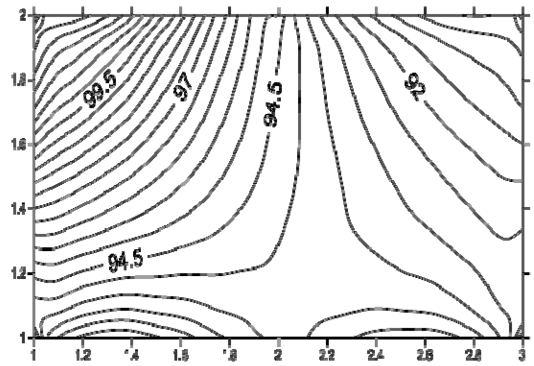
FigII. Shows that maximum noise pollution is located around middle pump.



Map IV. GIS map of pump area (Safe zone , caution zone and danger zone of noise pollution

Map.IV Shows that External areas locating the station in safe area and 98.5 dB (A) zone in danger area and the other zones in caution area.

C. Air- compressors zone in desalination factory



Map.V Isosonic map of air compressors zone

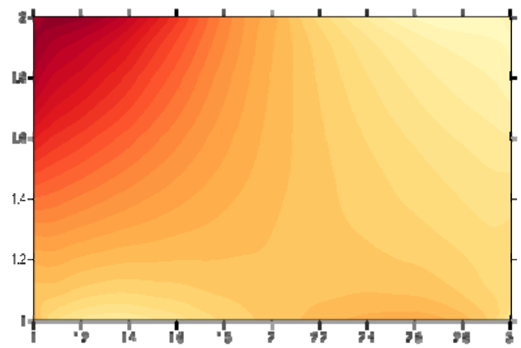
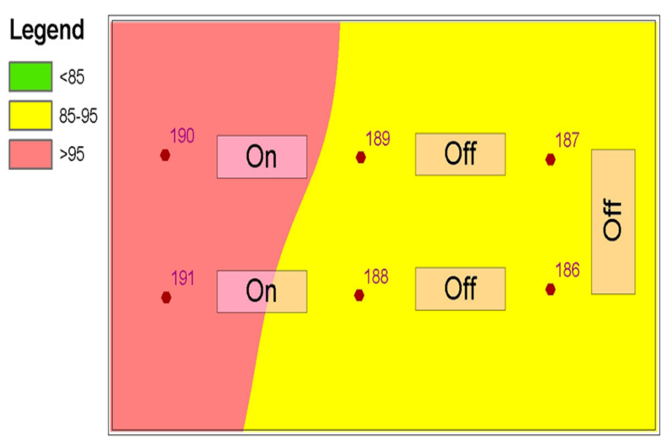


Fig III.Colorful counters of air compressors zone

FigIII. Shows that maximum sound pressure level is in ON compressors zone and especially upper compressor.



Map.VI GIS map of air compressor zone

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Map.VI shows that the zone of two ON compressors is located on danger area and the rest on noise pollution caution area.

II. Discussion and conclusion

On contour lines (Isosonic) maps of all stations, the contours have a curvature toward higher sound pressure levels.

In all stations, sound pressure level is higher among on acoustic generating sources having acoustic interference effect on existing space and the contours get closer to each other.

In fact, isophase amplitudes are summed with each other producing constructive interference or resonating. In such mode , there is a closeness on Iso sonic maps. In all of the studied stations, the sources generating the noise were grounded on cement platforms or cement ground and since such a bed has a high density, this matter may resonate the reflection of acoustic waves.

The studies concerning the noise pollution indicate that the issue of exposing to a noise more than the allowed limit is regarded as a hygiene and safety problem in this factory because the sound pressure level in under study zones is higher than the national allowed limit, that is, 85 dB. This finding supports internal and external similar studies in oil industry. For example, Nasiri and Zareh [3] in studying noise pollution in Lavan oily zone using sound maps found that sound pressure level into under study zone was higher than national allowed limit that is consistent with our research.

Then , it may be concluded that the problem of noise pollution is found at desalination factory and is higher than the allowed limit and a rapid decision – making is required for controlling and managing. Masumi and khedri [6] in studying the quality of modeling process and applying the maps and colorful contours of modeler sound system software (GIS) have concluded that through GIS maps , critical points may be determined easily and policies controlling made appropriately.

Henk [8] in studying noise tests and GIS found that the necessary use of GIS in studying the noise effect make it possible that the quality and efficiency of studies on the effect of noise become optimum and also GIS may play an important role in estimating and removing the threats.

Jantien [9] in studying the models predicting noise pollution and GIS pointed out that GIS can be a very strong tool for supervising the noise effects on environment and this matter would support the management of environment.

All of these results are consistent with the findings concerning stations modeling by GIS software , colorful contours and Isosonic curves.

III. Recommendations

With respect to these measurements performed in desalination factory, it was identified that at air compressors, electro-motors and pumps areas, the sound pressure level is higher than the allowed limit of 85 dB and as the stations of these sources have been designed as open and half open, it is recommended that concerning the enclosure of the sound generating sources as one of the engineering controls , precise research and calculations need to be performed. If enclosing the sources , noise pollution may be reduced to an acceptable limit , but during the enclosure the constraints with this method should be considered. For example , equipment enclosure can raise their temperatures and in some cases disturb the efficiency.

In such these cases, by using adequate air conditioning of enclosed space, this problem can be overcome. In addition , if enclosure of one source is needed , some valves (openings) should be considered for operator's access. As the presence of pores may influence the efficiency of enclosure a lot , proper sealing on required places need to be performed.

Appendix

The area of air compressors in desalination factory

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Electrical pump of fire fighting in desalination factory

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Comparison diagnostic validity of the completed fourth edition of the Wechsler Intelligence Scales (WISC-IV) with Tehran - Stanford - Binet Intelligence test in learning disable Student in Ahwaz

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***Abstract*—**The purpose of of this study to compare the diagnostic validity of the fourth edition of the Wechsler Intelligence Scale Intelligence Laboratory, Tehran has completed the Stanford - Binet learning disabled students in Ahvaz city. In this study of 60 learning disabled students (22 girls and 38 boys) elementary schools during the academic year **2013-2012** available were selected through purposive sampling and tools to complete the fourth edition of the Wechsler Intelligence Scale Binet intelligence test - Tehran were run individually on them. Causal comparative research design was descriptive. Diagnostic validity of three methods to calculate the scatter plot, intelligence and confidence intervals based combination was used.

The results showed that the scale Tehran - Stanford- weakly with all three methods, but has diagnostic validity of Wechsler scale combined with the diagnostic validity has no axis, but the other two methods of diagnostic validity. So the scale of judgment learning disabilities enjoy.

***Keywords*—**diagnostic validity, completed the fourth edition of the Wechsler Intelligence Scales, Tehran test of intelligence, Binet Stanford..

I. Introduction

T Compliance with these criteria important for the fact that it is all exciting developments in the world today people are born learning. In 1963, Samuel crack, in New York City for the first time the term "learning disabilities" for children who have problems in school, but they can not be considered as emotional disorders or mental retardation, Proposed (Ahadi and Kakavand, 2012, Fryar Rakhshan, 2000). Learning disabilities, and perhaps one of the most controversial issues is the education Exceptional Children that very wide range of academic problems it takes a full understanding of the needs in the areas of emotional, social, mental and behavioral child's life (Saydrydys, 2006).

The evolution of diagnosis and treatment of learning disabilities in the world has gone through four distinct periods.

1 Founding Period (1800 to 1930): This phase of the research base on specific brain functions and disorders of the screw. Theory of brain injury on children with learning disabilities in this course is formed.

2 transitional period (1931 to 1962): In the course of research findings about the brain and its disorders has led to the study of children with learning disabilities and specialist techniques to evaluate and treat the disorder created

(3) the integration period (1963 to 1980): This course is the

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fastest growing programs in schools to teach children with learning disabilities, using various theories assessment techniques, instructional strategies and legislation to protect the rights of these children will be determined .

4 contemporary period (1980 onwards): The appearance of this area of research orientation that field expands. The following achievements can be seen in the modern era (hopefully, 2005).

Students with learning disabilities can not participate in a variety of academic skills such as listening and comprehensive reading, basic reading skills, math computation and problem solving are consistent with the age (Fletcher, Lyon, Fox and Barnes, 2007). This group of students are afforded with that natural intelligence can not have a good academic achievement (National Joint Committee on Learning Disabilities, 2007, as quoted by Khankhany born and Bagheri, 2011). The students will experience failures after several years of study, signs of distress and alienation from the school show that this leads to emotional disturbance and antisocial behavior (Archer, 2003). And cause problems in the areas of social, emotional and education for the students (Frylych and Shtmn, 2010).

Before children with special needs are referred for special education, It is essential for them to be scientifically accurate and complete assessment to determine which cognitive abilities, learning disabilities, language processing skills, adaptive behavior in the environment, auditory and visual deficits, impaired motor skills, growth in what is (Department of public education in America, 2007, as quoted by Kamali, 2013).

Can only be used for groups of exceptional children in special education programs emphasized that the assessment, cognitive profile and the basis of the subjects depicted quantitative approach pre- the intelligence Sazeh, exceptional planning, accurate Brsnjsh on the may be conducted. (Afrooz and Kamkari, 2010).

With the advent of intelligence tests, cognitive abilities definite precision obtained with regard to academic performance can be used to determine the type and level of learning disorder (milky Aminataei Lu, Kamkari and Shokrzadeh, ,2013).

Many students are in schools that, despite the absence of any physical or emotional problems to severe learning difficulties suffer. Usually students of average or above intelligence on themselves, but the situation is almost the same compared to the other students are poorer academic performance.

Fourth Diagnostic and Statistical Manual of Mental Disorders Learning disabilities are included in the four categories which include: reading disorder, mathematics disorder, disorder of written expression, learning difficulties is unclear. Several studies have examined barriers to the education of students with learning disabilities and the lack of appropriate academic skills and strategies appropriate academic, social and emotional problems and reduce barriers to educational progress of students in the study described above (Fraser, Yangsrvm, Glatyn and Vatkyns, 2007).

One of the most fundamental problems that have been working in the field of learning disabilities is seen, the diagnosis is correct. The list of symptoms is used to describe learning disabilities problems involved. The question is: "How can a child is a child with a learning disorder, while only one out of the three signs".

Inability to identify properties that are used for specific learning disorders. One of the main problems is that the debate about the existence of a particular form of learning disorders in the general problem of learning is different, the weakening of (McKinney 1988, the others Flynn 1992, the quotes Westwood (1997) and Mkvndhsyny translation Shylandry, 2010).

The most common method of detecting and diagnosing learning disabilities, methods of observation, interview (history and questionnaire), and the use of psychological tests (the Kakavand, 2006 b; Seif Naraghi and rare, 1999; Seif Naraghi and Nader, 2010). Important point is that professionals have gathered data from various methods like pieces of a puzzle put together with unique artistry and elegance, the problem in complete punctur (Seyef naraghi and Nader, 2010).

The most common type of test used in the diagnosis of learning disabilities, individual intelligence tests, including the Wechsler scales and Stanford - Binet or some of the tests are practical and impractical. Wechsler scales are the most used in the diagnosis. The Wechsler scales and Stanford - Binet to detect cognitive impairment and impaired learning used (Karami, 2009).

Invalid use of IQ tests in the areas of education, children with special

And the lack of reliable criteria for identifying children with learning disabilities, has led to inaccurate measurements taken and before entering school students, are screened to identify those people and they do not exist in this time period and the fatal blow to the lack of motivation and academic achievement of these students will identify them. The impact was so severe in some cases

Best Age Intervention repair lost and compensate for lost time, there are (Askarian et al, 2011).

Hence, this research has taken place in the area of applied research in order to identify learning disabilities and psychological assessments used.

Methods:

The aim of the present study are in the areas of applied research and the research of causal terms - not comparable. To

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carry out this study, after receiving permission from the Ministry of Education's Khuzestan province, in the region of 2.3 and 4 Ahwaz Education Learning Center had specific problems, the four randomly selected. Then between all students with learning disabilities who were receiving rehabilitation services. 60 people purposive sampling available as samples and then completed the fourth edition of the Wechsler Intelligence Scale Binet intelligence test Stanford- Tehran were run on them. Data collection in the field and with respect to ecological validity, the process of examining the individual and by the means of the research groups was carried out. The diagnostic validity of these two measures in the diagnosis of learning disabilities individualized education program designed individually for each subject, with time, results were compared.

- There is a significant relationship between students' learning styles of different students.

Table4-2-1: Differences way scatter plot of constructive intelligence with emphasis on areas of verbal and nonverbal learning disabilities in children

Diagnostic validity	**Sig**	**Amount critical difference (0/01)**	**Amount critical difference (0/05)**	**Amount difference experimental**	**Factors Producer Intelligence**
No	---	3/63	2/76	2/94	Nonverbal fluid reasoning
Yes	0 0/5	3/62	2/75	2/97	Knowledge of nonverbal
No	---	3/63	2/76	2/20	Quantitative reasoning, nonverbal
No	---	3/62	2/75	1/80	Nonverbal visual-spatial processing
No	---	3/49	2/65	2/14	Nonverbal working memory
Yes	0 0/1	3/63	2/76	3/74	Fluid reasoning, verbal
Yes	0 0/1	3/62	2/75	6/04	Verbal knowledge
No	---	3/63	2/76	2/09	Quantitative reasoning, verbal
No	---	3/62	2/75	1/77	Verbal and visual-spatial processing
Yes	0 0/1	3/49	2/65	4/32	Verbal working memory

Question 1: Is Stanford- Binet intelligence test of Tehran in learning disabled students in Ahwaz, diagnostic validity?

Referring to Table 4.2.1, and given the differences were statistically analyzed with the way scatter plot constructive tasks of verbal and nonverbal intelligence, with an emphasis on areas,

We can realize that significant difference between the knowledge of nonverbal, verbal fluid reasoning, working memory, verbal learning and verbal scores of students with learning disabilities, and the knowledge of nonverbal, verbal fluid reasoning, verbal learning and verbal working memory in children diagnosed with learning disabilities their diagnostic validity. And the nonverbal fluid reasoning, quantitative reasoning, non-verbal, visual-spatial processing non-verbal, nonverbal working memory, verbal and quantitative reasoning, visual-spatial processing, verbal learning has diagnostic validity in identifying students with disabilities are not. Also according to statistical analysis with confidence intervals determined by the interest the eight intelligences IQ test of Tehran Stanford - Binet IQ knowledge, then IQ and verbal IQ, fluid reasoning, working memory, IQ, nonverbal IQ quantitative reasoning and IQ among students with disabilities learn to be less than minimal and has a confidence interval is greater than one standard deviation. Thus, the interest Intelligence Assets and diagnostic validity of the identification of learning disabilities can be high.

Roid (2011), Roid (2010)) show that through fifth edition of the Stanford-Binet IQ test, it can be determined from deficits in working memory and knowledge of disability diagnosed before school entry. So you can use these two factors as indicators to identify suitable discrimination and screening for learning disabilities used. It was also shown good reliability and validity of this instrument for screening these children is exceptional.

Findings with the results of the investigation Mousavi (2010), Askarian (2011), Javid Nia (2012), Javid Nia, M., Molly and Kamkari (2013), Roid (2011), while results are consistent with findings in the field Karimi R and Kamkari (2013) does not comply.

Thus, the results related to the validity of the IQ test is that it represents the five elements of the intelligence test, the "knowledge of non-verbal", "fluid reasoning, verbal", "Learning and Verbal" verbal working memory "are the property of diagnostic validity and can be use this tool as a valid instrument to identify students Natvan¬Yadgyry used. The "Bhr- intelligence knowledge," "verbal IQ", "Bhrastdlal fluid intelligence," "working memory, IQ," "nonverbal IQ" and "IQ Quantitative Reasoning" and has the confidence interval is greater than one standard deviation He stressed the indicators, accurate diagnosis based on, being learning disabled student inferred.

II. Conclusion

Also according to statistical analysis with confidence intervals determined by the interest the eight intelligences IQ test of Tehran - Stanford - Binet IQ knowledge, then verbal IQ and IQ, fluid reasoning, working memory, IQ, Nonverbal IQ and IQ Quantitative Reasoning Respectively, in the learning of students with disabilities have lower rate and has

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undergone a confidence interval greater than one standard deviation. Thus, the interest Intelligence Assets and diagnostic validity of the identification of learning disabilities can be high.

Roid (2011), Roid (2010), Stanford-Binet IQ test showed that the fifth edition, can be identified deficiencies in working memory and knowledge of disability diagnosed before school entry. So we can use these two factors as indicators for identifying and screening for learning disabilities use a good cleaning. It was also shown good reliability and validity of this instrument for screening of children with exceptional professionalism.

The findings of this study with the results of the investigation Mousavi (2010), Askarian (2011), Javid Nia (2012), Javid Nia, M., Molly and Kamkari (2013), Roid (2011) line, while the results of the field the research findings and Kamkari Karimi (2012), does not comply.

Thus, the results related to the validity of the IQ test is that it represents the five elements of the intelligence test, the "knowledge of non-verbal", "fluid reasoning, verbal", "Learning and Verbal" verbal working memory "are the property of diagnostic validity and can be use this tool as a valid instrument to identify disordered students used. The "Bhr- intelligence knowledge," "verbal IQ", "Bhrastdlal fluid intelligence," "working memory, IQ," "nonverbal IQ" and "IQ Quantitative Reasoning" and has the confidence interval is greater than one standard deviation He stressed the indicators, accurate diagnosis based on, being learning disabled student inferred.

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Quality evaluation and stability index determination of Kermanshah potable Water resources

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***Abstract*—** This study aims to determine the potential of corrosion and scaling of water in Kermanshah. Samples from different areas of Kermanshah were taken and all of the samples were analyzed. Parameters such as temperature, pH, alkalinity, total dissolved solids and hardness were measured. According to Langelier saturation index, water is corrosive and based on the values of Rysner index water has a tendency to severe corrosive. Due to the effects of corrosion and its damages to water supplies and distribution systems, this is very important to pay attention to this issue and control water chemical balance.

***Keywords*—** Corrosion, scaling, water quality, Kermanshah.

I. Introduction

ONE of the factors that must be considered in water quality is the problem of corrosion and scaling [3]. Corrosion and scaling are the major problems in water distribution systems. Corrosion is the physicochemical Interaction between a metal and its surrounding environment which results in changes in the properties of the metal [7]. This harmful process can affect public health, water quality and costs of safe water supply, corrosion also caused economic, healthy and aesthetic issues [1]. Disintegration of metal that occurs because of corrosion spends a lot of money to repair, replace, and maintain the scarce resources of distribution system annually [8]. Corrosion causes problems such as creation of holes in the pipes, need of replace corroded pipes, reducing the lifetime of the facility, subsidence, water loss and entry secondary pollutant into the distribution system that is causing a great loss of costs [21], According to studies, in many countries like America, Japan, Australia and England the costs of corrosion was almost 3-4% of their national income [5]. In addition to the financial losses caused by damage of facilities, the most important issue related to corrosion is the presence of cadmium and lead pollutant that cause serious harm to public health [10]. Scaling is a process in which bivalent cations such as calcium and magnesium reacts with other dissolved substances in water to form a deposited layer in the pipe wall [13] Studies show that most scale formation in water distribution systems consisting of calcium carbonate, magnesium carbonate, calcium sulfate and magnesium chloride . Deposition process leads to problems such as blocked tubes, reducing the flow rate and increasing pressure drop across the network that it also increases the operational costs associated hydraulic structures [4]. Sediments can also cause many problems in homes systems like increase the amount of energy consumption [1]. Lowental and colleagues [18] reported in a study in South Africa that corrosion and scaling are from major problems in transmission and distribution systems of groundwater in this country and the mechanism of the effect and its intensity depends on the quality of water and type of pipe. These day economic problems associated with corrosion and scaling allocated a high percentage of per capita income of different countries.

In the United States, the annual cost of corrosion and scaling estimated more than 300 billion dollars that is more than the amount of 4-5% of Gross National Income of this country. Unfortunately, accurate statistics about damage of corrosion and scaling is not available, but it is reported that average unaccounted water in Iran is about 30%. Moreover, it is believed a significant portion of this water is attributable to leaks due to corrosion besides the cost of spending to replace or repair the damaged pipe [15]. Due to these factors and the effect of chemical quality of water on corrosion and scaling in different parts of water supply facilities and health problems and economic issues consequences of these processes and no comprehensive study on the water corrosion and scaling potential have been performed in Kermanshah, The aim of this study was to determine corrosion and scaling potential of potable water of Kermanshah.

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II. MATERIALS AND METHODS

This study aims to determine the potential of scale formation and corrosion of water in Kermanshah by using Rysner and Langelier indices. Random samples of 11 different sites in Kermanshah from water distribution network were taken accordance with the instructions described in reference books ((Standard Test Method for Water and Wastewater)) and analyzed by standard methods. The volumes of samples were 2-3 liters. Tests were performed in accordance with procedures of Standard Method [9]. Sampling points were marked with the code A1 to A11. Three samples from each point took and tested and finally, the mean value of each parameter was specified in every point. In this study, meanwhile the sampling the temperature and pH of the samples was measured and just after transferring the samples to the lab for chemical parameters were studied. The samples were analyzed for pH, temperature, hardness, alkalinity, and total dissolved solids. Total dissolved solids were measured by gravimetric method and titration method was used for determination of dissolved solids and alkalinity. Two indices commonly used in the water treatment industry to evaluate the nature of a water source are the Langelier Saturation Index (LSI or Saturation index) and the Ryznar Stability Index (RSI or Stability index). In both cases these indices are based up on a calculated pH of saturation for calcium carbonate (pHs). The pHs value is then used in conjunction with the water's actual pH to calculate the value of the index. Determination and calculation of corrosion and scaling potential of the water was done by Langelier index (Equation 1) and Rysner (Equation 3), as follows:

$$LI = pH - pHS \quad (1)$$

Where, pH is measured pH of the water and pHS is pH at calcium carbonate saturation and is determined by the following equation:

$$pHS = (9.3 + A + B) - (C + D) \quad (2)$$

Where:

A = [log (TDS) -1)/10], Total dissolved solids (mg/l)
B = [-13.12 log (T + 273)) + 34.55], Temperature, T in oC
C = [log (calcium hardness) - 0.4], calcium hardness (mg/l CaCO3)
D = log (alkalinity), alkalinity (mg/l CaCO3)

$$RI = 2(pHS - pH) \quad (3)$$

Equation (1) was used to measure LSI and then the potential of scale formation and corrosion of water were determined. A negative number of LSI indicates corrosive water and there is no potential to scale. A positive number of LSI indicates over saturated and it can precipitate calcium carbonate. If LSI is zero, water is at equilibrium. If RI was less than 4, water will be super saturated and tend to precipitate CaCO3, if RI is 5-6, water tend relatively to precipitate and slightly corrosive, if RI is 6-6.5, water is saturated and CaCO3 is in equilibrium and water is not corrosive nor deposition, if RI is 6.5-7, water is corrosive and low precipitation and if RI is more than 8, water is under saturated and tend to dissolve solid CaCO3, it means that it is severe corrosive water.

III. RESULTS AND DISCUSSION

To determine the corrosion and scaling potential for potable water in Kermanshah, water quality parameters such as temperature, pH, total alkalinity, calcium hardness and total dissolved solids were measured and the average value was determined. Then the corrosion indices were calculated using the equations presented in the previous section.

In Table (1) physicochemical parameters measured in the studied samples is presented.

Table 1: physical and chemical characteristics of studied samples

Sampling point	Temperature (C°)	TDS (mg/l)	Ca .H (mg/l)	PH	T.ALK (mg/l)
A1	25	283	158	7.5	219
A2	20	276	180	7.2	200
A3	8	233	140	7.38	136
A4	27	316	172	7.1	184
A5	7	398	115	7.8	160
A6	26	368	104	7.2	136
A7	12	304	140	7.5	200
A8	28	368	180	7	208
A9	21	312	188	7	228
A10	22	308	172	7.2	160
A11	11	406	168	7.5	270

RI and SI indices calculations of samples are presented in Table (2).

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Table 2: Calculated values of corrosion indices

sampling point	LSI	RSI
A1	-0.255	8
A2	-0.19	7.56
A3	-0.43	8.24
A4	-0.21	7.53
A5	-0.27	8.35
A6	-0.49	8.2
A7	-0.2	7.9
A8	-0.24	7.5
A9	-0.3	7.66
A10	-0.27	7.8
A11	-0.4	8

Similar studies show that the Langelier and Ryznar indices use more than other corrosion indices. The result show the mean value of Langelier and Ryznar indices is 0.295 and 7.89. According to LI value water is corrosive and based on RI value, water has intense corrosion tendency. Also based on spot check of water, in most cases Reisner index was higher than 7 that shows indicates the water is more corrosive. Shams and colleagues [22] studied the Corrosion and Scaling Potential of Water in

Rural Water Supply Distribution Networks of Tabas, they reported that the water is corrosive, and the presence of sulfate and chloride anions in water can be the main reason for this issue. Study of the potential of corrosion and scaling in drinking water in Behsahhr city by Nikpour and colleagues [19] showed that mean value of Langelier index on wells, springs, resources and Behshahr distribution network was 0.28, 0.1, 0.2 and 0.13 which represents water is at equilibrium and a slight protective CaCo3 lining on pipes could be formed. Also mean value of RI was 6.81, 7.51, 7.4, 7.12that show relative corrosion of studied samples. A study by the Dehghani and colleagues [11] conducted in Shiraz drinking water indicates 95% of samples exhibited a scaling potential, according to LSI value. Study of corrosion and scaling potential of drinking water in supply systems of military facilities was carried out by Qhanizadeh and Ghaneian in 1387, they found that the drinking water 3center has the corrosion potential and in 6 centers it has scaling potential [16]. The study by heibati and colleagues, in water supply wells in Mianeh, Iran, show that drinking water has tendency toward corrosion [17]. Survey on corrosion and scaling potential of groundwater spring in Bahar-Hamadan, by Yazdani and colleagues [24] show that Langelier index is not suitable to evaluate corrosion and scaling properties of samples and these ground waters have a low to moderate corrosion and scaling potential.

Result of a survey done by Mazloomi and colleagues [6] on water in Shiraz by mean of LI, SI, Agressive and Puckorius scaling indices showed most of the time the drinking water has a scaling potential and only in some it was corrosive. In a research by Fazl zadeh and colleagues, on determining the corrosion potential of produced water in Ilam Water Treatment Plant, during 2007 to 2008, they founded that, by average, water has corrosion tendency [14]. A study carried out by Savari and colleagues [2] on the water distribution network of Ahvaz using the Langelier, Ryznar and Puckorius Scaling Indices showed that water has corrosion tendency.

Taghipour and colleagues [23] studied the quality of water in Tabriz by using the Langelier, Ryznar and Puckorius Scaling Indices and GIS software and they found the water is corrosive. A study conducted by Raeiati [20] in Shahrood city showed that based on the Langelier saturation index is 57 percent of water is slightly corrosive and the rest of the city water is very corrosive. He reported that the city's water is corrosive, based on Rayznar index. Although the corrosion and scaling potential or equilibrium of water quality not paid much attention in monitoring systems sedimentation and water supply in the country but this study and some other studies show that Water chemical balance of some provinces is not suitable and corrosion and scaling happen in this distribution network that correspond with the results of this study. Due to the corrosion effects and its damages to water supplies and distribution systems, this is very important to pay attention to this issue and control water chemical balance. Also, because of the effect of scaling on decreasing the useful life of the facility and increasing fuel consumption in residential and commercial centers and the effect of high consumption of energy on air pollution in urban centers, it is very important to control this issue.

IV. CONCLUSION

Calculation the indices reflect unbalanced water chemical quality which causes corrosion in water systems and other equipment. For this purpose a suitable planning for balance the water quality in this area is necessary in order to reduce economic losses. Water chemical quality monitoring and controlling balance of water can increase the useful life of water supply facilities and reduce the possibility of leaks and water loss. The lows are very important in arid countries such as Iran. Due to the effects of hardness, alkalinity, total dissolved solids and pH on pHs, and therefore on the potential of corrosion and scaling of water, controlling the water quality parameters and determination the corrosion and scaling potential of the water network should be done at least annually.

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Geopolitical interaction and international law of energy

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Abstract—If we knew Geopolitics as the complex relations of power in the international system based on political geography, economy and culture, energy as the primary source of human activities in all aspects of life has an important role in this framework. In contemporary international relations, accurately mapped geopolitical interaction with energy can be put many opportunities for decision-makers and decision makers of a country's foreign policy. On the other hand, the international law of energy as a relatively new field in the interaction with the geopolitics formed and developed. Exploration, extraction, energy transfer, finitude of fossil fuels resources and the emergence of environmental problems, has created a new discourse in international relations. Also, the sustainable development and environmental protection, the use of fossil energy carriers should be replaced with renewable energy sources such as wind energy, solar energy, geothermal energy, biomass energy and etc, is the beginning of a new geopolitical conflict in the contemporary world. Hence and given the positive points of environmental, economical and especially legislation in other legal systems such as European Union agreement regarding the energy charter in 1994 and since that study and analyze the energy issue and status not only environmental and economic point of view, but legally has also a special place, therefore the current paper focuses on the issue of energy sources & consumptions status in European Union law in order to provide legal pattern in Iranian legal system and comprehensive energy policies managed by European Union in the grounds of energy such as environmental protection, renewable energy applications, diversity of energy sources, using new technology in reducing energy consumption, expand international cooperation and regional laws and regulations regarding energy and environmental protection.

Keywords: Geopolitics, Energy law, European Union, Environment, National law, International Environmental law.

I. INTRODUCTION

Energy has always been at the service of humanity from the beginning until now has brought a lot of prosperity to human society in different shapes and different types. Energy not only affects many agreements and inter-state relations, but we can say that many of these interactions, occurs mainly due to the achievement of energy. In the years after World War II oil consumption has climbed steadily, its consumption during the first oil crisis 1973- 1974 surpassed the coal at least in the advanced industrial countries. At this stage, governments found a direct source of new natural gas from seabed and quickly thus natural gas replaced coal. As the process of industrialization in western developed countries in the period after the Second World War was over; Coal, oil and natural gas each took a share in primary energy consumption that the coal supplied a large part of fuel for electricity generation, Gas, a large part of the area of heating fuel and oil, a large part of the area of transportation fuels. The exact proportions of each of these fuels were different in each country and were dependent on issues such as accessibility and indigenous reserves. For example, the United Kingdom and the United States had huge reserves of coal that of course, the United States, had oil in addition to coal. Although they also imported oil from the Middle East, as Britain and other industrialized countries did so. Conversely, some of the newly industrialized countries such as Japan, had little coal reserves and didn't have oil and forced to import fuel.

As the main concern was about the scarcity of fuel; Oil crisis, with the first signs of serious concerns about the environmental impact of fossil fuel consumption, were simultaneous. As a result of what was considered "oil crisis" another view was arrange of new technologies including the use of natural energy sources such as wind and sun, which collectively, are called renewable resources, because, unlike fossil fuels, these resources will never be finished. Nuclear power that until World War II was developed with slow acceleration in the West, flourished and expanded. In this respect, this model was followed, until the early 1980s Oil prices declined in real values and natural gas Became New and cheap fuel and nuclear power spread, but not so fast that its supporters had expected. Economic and technical problems, brought disruption in their progress. The Three Mile Island accident in Pennsylvania in 1979 effectively halted this progress; the share of nuclear power in the world level would swing about 5 percent of primary energy which reached 7.5 percent until 1992. Renewable energy technologies yet have passed her childhood, however It is important to note that Hydroelectric dams produce over 20 percent of global electricity from a renewable resource and In some countries (particularly Brazil and Norway) water resource sectors provide the highest level of power input.[13] But, generally speaking, in most industrialized

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countries, coal, oil, and increasingly gas, still remain dominant options.

II. ENERGY GEOPOLITICS AS A COMPONENT OF POWER

Since geopolitics, in fact is the geographical result of a policy, in a geopolitical analysis, all efforts are to establish connections between the centers of international power and geographic areas and aim at clarifying the role of geographical factors in the politics of countries because political events always happen in a geographical environment and geographic factors affect the process of political phenomena , as has been said: "Regardless of all the environmental factors, both human and inhuman, tangible and intangible, it can not be fully recognized the international political environment"[4], This means that in the field of international relations, political actors don't have total freedom and are heavily influenced by geographical factors, and therefore, have limitations in decision-making.

"Geopolitics" consists of the words "geo" means earth and "politic" means policy. In Persian there are equivalents such as "geopolitics", "geopolitical science" and "politics of geography" for it. In English it is referred to as "Geopolitics", in German it is referred to its leading source, "Geopolitike" and In French it is referred to "Geopolitique". In term "geopolitics" is an approach to foreign policy that aims to explain and predict the behavior of the political and military capabilities in the natural environment. Thus, the geopolitical approach with different degrees represents a decisive and deterministic influence in political events and historical geography[5].

So, in geopolitical theory, Geographic structure in which power is exercised has a strategic role and the critical points match with strategic locations. Also, the area which holds the great powers attention is effective in maintaining or disrupting communication, and has Geographical and political significance. In addition, the geopolitical importance is not neither positive nor negative factor and Depends on how you use it. Effectiveness of Geo-political situation depends on the active and expert human and only in this case leads to success; otherwise it is a critical factor. In geopolitical analysis, the goal is to explain the relationship between international power centers and geographic areas. Finally, in contemporary world, "Geopolitics" doesn't mean only Compete policy strategy at the global level, But is a complex mixture of many warring factors and elements that Compete and conflict on the lands of small sizes. Its purpose is either to prove the superiority of their political or to expel political rivals from the scene.

A. Energy diplomacy in international relations

Diplomacy is a tool that the foreign policy uses it to achieve its objectives through agreement rather than conflict and the definition of beginning of the war is a failure of diplomacy. On the other hand, Center of diplomacy is "agreement" on a specific topic this could be a need or goal that is shared by politicians. "Energy diplomacy" is a strategic, comprehensive and efficient plan that develops the international cooperation in the energy sphere for a country and clearly defines the overall framework of agreements. In general, the "energy diplomacy" in each country, Helps to create opportunities for international engagement in order to maximize the benefits of geopolitics and geo-economic and attempts to take steps based on power tools, in order to reduce international threats. As the need for energy provides the necessary conditions to conclude treaties, agreements and international relations, energy diplomacy is a competitive plan that can provide necessary conditions to obtain the maximum national interests of each country in international relations that are based on energy. what can be expected from energy diplomacy is "Assessing target markets for energy, determining the type of presence in specific markets, Studying the attractiveness analysis and the lack of appeal to presence in treaties or participation in the global energy organizations (such as OPEC and the Gas Exporting Countries Forum) and to take part in their decision making, Setting the prices for the presence in certain markets, Providing strategies to maximize use of Geographic in order to influence the global energy markets, positioning towards developments in the global energy market and determining exporting energy carriers cart"[6].

In this regard, some authors speak of the Energy Cold War in Diplomatic relations that despite a little indulgence, demonstrates an undeniable reality in international relations[9].

B. Dependence of developed countries to energy

Having and not having energy reserves, divides the world into two groups. The first group that has the highest consumption of energy in the world has a tiny proportion of the world's oil and gas reserves. For example, the group of industrialized countries that burns approximately 62% of the world's oil has only 7% of oil reserves. These countries supply 34 percent of their needs from oil producing countries and they need to second batch or countries with oil and gas reserves to provide their energy. In This category, the Middle East, with more than 65 percent of world oil resources, consumes only 8.4 percent of the energy. The basic policies of consumer countries are supplying secure energy and providing security of supply. Security of supply requires a stable and reliable market to provide affordable energy to consumers. High dependence of developing countries to the latent energy in the countries that have this reserve, Produce strategic opportunities and threats for these countries, including our country. Experience shows that countries lacking Energy sources, Use of any means to supply the energy requirements including colonialism, coups and puppet governments in oil producing countries. Although some of these methods, may seem somewhat outdated, but still using the weapon of Force and violence to provide this vital material Continues. Many political experts believe that military presence of America in the region and occupation of Iraq Arises from dark landscape of energy on the United States and attempts to control the region's oil and gas resources. In other words, supply security has led the

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America to invasion to the region and to establish a strong military base there[21].

C. The role of energy in component's power of Iran

In contemporary relations, there are many different definitions of the elements of "power". Among definitions "energy" as a constituent element of "power" is based on consensus of scholars of international relations. Energy plays an essential role in industrial economic life of communities; this means that if enough energy is available to you economic development will be possible. Look at the problems of the past shows that there has always been a major worldwide campaign to seize energy because the national security and stability of governance systems largely depends on the availability of those resources. Fortunately, Iran in terms having a variety of energy resources is one of the richest countries in the world[19]. Iran, as a member of the Organization of Petroleum Exporting Countries is one of the three countries with the largest oil and gas reserves in the world[20].

Case Study - strategic importance of the Caspian region energy, New Platform of European Union to Presence in the region

Strategically, the Caspian region has become one of the most important areas in recent years and this caused the area to attract the attention of regional powers and global superpower. Oil resources of the region increased the geopolitical significance of that and put it in the focus of security and political considerations and best diplomatic and economic efforts[1]. With the active cooperation and participation of the Caspian Sea littoral states, the sea in the near future will be substantially as a major exporter of crude oil in the global energy markets. This is dependent on the legal regime of the Caspian Sea. Because "differences in the legal regime of the Caspian Sea is a complex factor in the development and expansion of the sea resources ", therefore its resources are not exploited properly and logically[8].

United States Department of Energy experts estimate which oil reserves of the Caspian Sea contains about two hundred billion barrels (about 16% of global reserves). However, many argue that the released statistics for estimating oil and gas reserves of the region are exaggerated. A look back at the end of 2003 to Caspian Oil and Gas shows the exposure of the new reality which the world has been wonder of its Revealing. Wonder, because it represents how the American public relations and media can exaggerate the size of the reality and impose what is the benefit of Big Oil companies on the people of the world. Finally, it became clear that Caspian oil cannot convert the region to second Persian Gulf and also cannot save this region from backwardness in terms of development. The total proven reserves of oil could be 50 billion barrels at the maximum and this is 4% of world total and it cannot bring to conquer the global energy market. But it can be Effective.

There is another view of the Caspian Sea which implies that the Great game in the Caspian has expired. This means that the Caspian oil fields as the United States promoted, are not attractive and the other that by the construction of Tngyz-Novorossiysk and Baku-Tbilisi-Ceyhan pipelines, strategic competition for the pipeline has ended. "Colin Kmybl" oil geologist says that the recent discoveries in the Caspian Sea are frustrating. Approximately 80% of world Ozan Bvrndnya fish (sturgeon) is in the Caspian Sea. Oil can be achieved in the other parts of the world, while the caviar is only found in the Caspian Sea. The legal status of the Caspian Sea and its legal regime is facing four major problems:

A) lack of a comprehensive agreement (overall) on the utilization of the resources of the Caspian Sea;

b) Free navigation problems;

c) Environmental problems of the Caspian Sea and;

d) Issues related to fishing (fishery) and protection of biological resources of the Caspian Sea.

Currently treaties of 1921 and 1940 that are concluded between Iran and the Soviet Union Govern the legal status of the Caspian Sea. These treaties have not yet officially void, because no new document has been set to provide a basis for the legal regime of the sea. Disintegration of the Soviet Union and the increasing number of member states of the Caspian littoral did not change the legal status of the Caspian Sea and just cause some unilateral claims from coastal states. "From the global and international perspective, the Russian Federation is inheriting obligations o obligations of the former Soviet Union." According to regulations and the rules of international law Change in the number of parties of a treaty has no affect on its legal status; this means that the legal status of the Caspian Sea To be continued based on treaties of 1921 and 1940, Unless a new treaty to be signed on changing the legal regime that In this case the new treaty shall prevail (Of course, in those parts of the former treaty that are outdated). So the legal status of the Caspian Sea follows the treaties of 1921 and 1940 that were concluded between Iran and the Soviet. As a result any unilateral action to determine share, Regional divisions, and arrangements relating to the operation of offshore and allowing discontiguous states to do similar activities violates the legal regime of the Caspian Sea.

European Union has eyes for the future of energy in the Caspian region for two essential reasons: First, because it's hard to supply energy from the Persian Gulf region after the end of the Cold War and the collapse of the Soviet Union, since there has become an arena for United States of America, And on the other hand the cost of energy transfer according to Iran's regional influence will increase day by day, Iraq war is an example of increasing cost of energy supply from Persian Gulf. So to supply the energy of the European Union should strengthen structures and exploration of oil and gas in the Caspian region, Second, the EU that consists of 28 countries, imports nearly half of its energy from outside and for its continuity should take advantage of the various resources and should gradually

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consider new sources along with traditional sources of energy supply[15]. The European Union is aggressively seeking to exploit oil and gas resources in this region. In this context, European Union Follows three policies on energy supply:

1. Creation of a common European Policies for energy which to implement these policies it also benefit from security structures such as NATO. So that the main theme of the "Riga" meeting which was held in November 28-29, 2006, at the NATO summit, was to discuss about energy supply for European Union.

2. Strengthen the power of the free market Policies, that this policy was required despite resistance of European large companies in July 2007 and Based on this policy the flow of energy in the EU became Smoother . Although this policy has been developed to create competition in the energy sector in Europe But obviously strengthen the power of free market Policies is more in favor of the more industrialized countries of the European Union for energy supply that can easily benefit from less industrialized countries of European Union that usually are energy producers.

3. Close communication and cooperation with the countries having the energy, this format of European Union has worked to establish a new relationship with energy-exporting countries, by providing economic, political and even military assistance especially through the expansion of NATO to the east[16].

According to an article that was titled, our country despite having good opportunities and strengths in use of instruments in the field of energy in order to participate effectively in international equations, has not yet achieved its proper place in this area that this is originated in the absence of strong and efficient energy diplomacy. Looking at the future of energy in the world, with an emphasis on the potential of country in the energy sphere shows that on the current situation there are good markets for the country that in the future, the size and importance of these markets will be added. Yet the presence of Iran in these markets requires a competitive edge by countries such as Russia and Qatar that have financial resources and facilities in order to compete with Iran. Effective participation in this competition requires a strong energy diplomacy that should be developed by identifying the strengths of Iran energy so that by Benefiting from strengths and by resolving weaknesses, use the opportunities and overcome threats.

III. INTERNATIONAL LAW WITH EMPHASIS ON ENERGY RESOURCES AND ENERGY CONSUMPTION IN THE EUROPEAN UNION

International Energy Agency has provided two scenarios for global energy outlook:

1. Reference Scenario which is plotted by assuming continuation of current trends ruling the world energy and includes all policies and measures that states have adopted until mid-2008 and new policies are not included here.

2. Alternative Policy Scenario, That is developed Based on bringing improvements in the implementation of current policies. In the reference scenario, world energy demand between 2006 and 2030 increase at a rate of 6.1 percent, In this regard and in addition to the need for improvements in the current trend, measures that the Agency has been referred to include: The emergence of low-carbon technologies, which may include conservation and use of fossil energy sources, the development of clean technologies and utilization of biodegradable energy resources. In this regard and while environmental concerns perhaps even go beyond an incentive for them, Europe witnessed an expansion of the development of renewable energy. A part of this pattern of development and developmental processes is presented in the following topics.

“Denmark” is a pioneer in this field; this is partly due to the decision of the State On avoiding nuclear power plants, and that wind power is the most obvious sources of its energy. The structure of financial support of this project includes a series of subsidies for wind turbine operators and other renewable systems. As a result, more than 3,500 wind turbines has been installed in this country, approximately 70% of them belong to local residents, through cooperative societies that have included around MW 300 electrical installation until 1991. Denmark is also ranked first and Pioneer in the context of establishing and building wind farms in coastal waters of the world, and has implemented a MW 3project with eleven turbines in Vyndbay.

“Sweden” Followed the model of Denmark and decided to try to remove its nuclear power plants from the activity cycle. Initially, several large wind turbines at a cost of about $ 40 million was allocated to wind power, it was established between 1991 and 1996. This country to develop an offshore wind farm has projected 98 turbines. A range of other renewable energy projects are under way, the most important of them is the use of biofuels. “Holland” has a remarkable program for the use of wind power with the aim of building capacity 450MW Electrical of wind power by the year 2010. The structure of financial support of the country of these projects is similar to Denmark that up to 40 percent of the cost of investment in wind projects is financial assistance by the government.

"Norway" is now producing a lot of electricity from its hydroelectric power facilities and has completed Utilization of wave energy systems.

"Portugal", is also working in this field. In general, the use of renewable energy in each country Forms the geographical situation of the country and a renewable resource that defines this situation. Countries on the North Sea coast have a considerable power of the waves and the Nordic countries have appropriate resources, For example, European countries have supported large scale solar thermal projects in "Italy" and that active solar power is applied widely in

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"Greece". However, both countries are interested in wind power.

"Spain" has also remarkable programs in use of wind power, and has installed "wind pressure" in American style, and intends to install a set that its power generation reaches to750MW by the year 2010.

Biofuels such as Rape methyl ester or "bio-diesel" are important in many European countries particularly in "French", in this country; the large areas are devoted to the cultivation of energy crop. "Austrian" has also widely used biomass to provide fuel for district heating networks.

Tidal forces (tidal) are another technology that depends on geographical situation. Britain has very good sites in this regard but so far the only major tidal energy project in Europe is the sealing with production of 240MW Electrical at the mouth of the Rance River in Brittany (France) which was completed in 1967 and it's in contradiction with Full range program of French nuclear power. But, surprisingly, France seeks to review its energy policy of 1995, and now it seems that it's conducting great things in the field of renewable energy, especially in the area of wind power.

"Germany" which came relatively late to the field of renewable energy, followed the model of Denmark and highly supported the wind power, at the national and local levels, through government grants and the market subsidies. The total budget for the development of wind power market in Germany was 75 million marks between 1979 and 1994, while the German government approximately allocated 328 million marks to research and development of wind technology between the years 1974 and 1993. Until 1993, 1800 wind turbines installed in the country, the total installed capacity was approximately 334MWand until 1995 Germany's total power generating capacity of wind power overtook Denmark with MW 1100.

Concerns about global warming and environmental pollution reinforce and highlight German policy about renewable energy. Following the Earth Summit on Environment and Development that United Nations held in 1992 in Rio de Janeiro, Germany is committed to reducing carbon dioxide emissions by 25% [1].

A. European Union Region

Besides supporting projects that every European government Provide, Commission Of The European Communities(CEC) Supply Financial assistance that basically supports NREL plans as a part of the European Union response to the greenhouse effect and environmental protection. These programs are basic stages of the innovation process, which means, changing the direction of research and development and then following the trade show. Until 1989 the European Union commission budget allocated to renewable energy was 5/435 ECO (about 360 million dollars) and it's still increasing[16].

A report from CEC In 1993 as "The European Renewable Energy Study" (TERES) estimated that European Union supplied Only about 4.3 percent of its energy from renewable resources however, the same report states that if all environmental concerns are taken into account and reacted toward it, Western Europe based on the most ambitious scenario, could supply up to 13% of its primary energy from renewable sources by 2010. Note that the total amount of energy is not just electric element. This pattern varies in different countries of Europe, as Spain has the potential of producing 20 percent of its energy from renewable resources and Italy 23 percent, while the United Kingdom until 2010 only can supply 9 percent of its energy from renewable sources. CEC report explains the relative poverty of UK in this area as: Although the United Kingdom is satisfied with its optimum potential for the exploitation of renewable resources and proud of it, this country is the most self-sufficient consumer of fossil fuels.

Therefore, there is no long-term strategy for energy as a major priority for the government. With the dissolution of the Department of Energy In 1992, the last survivor of such a strategy Disappeared. The report says: Equipping all potentials in the country for renewable energy technologies can only be developed in such a framework and therefore are unlikely to achieve in the medium term, however, to compensate for market failure in this area, renewable technologies shall meet the objectives of the government moderately.

CEC increasingly has carried out operational initiative in Central and Eastern Europe, and TERES has also considered energy options in that area: This institution estimated that until 2010 Central and Eastern Europe will supply up to 12% of its primary energy from renewable energy sources.

Former Soviet Union had taken steps in wind power and has had plans to take advantage of tidal energy. However, while the energy resources are high at that point, due to the economic crisis caused by the collapse of the USSR, it's likely that important issues arise from the provision of renewable energy technologies in the region, particularly in determining and approving the budget for it.

Certainly, due to the fact that the existing systems of energy production in many of these countries are polluting and inefficient, supporting the establishment of renewable energy technologies and improving energy efficiency should be a priority. West is ready to provide assistance in this area, the main part of that is associated with cleaning up fossil fuel and nuclear power plants. Commission for European Committee on Energy and the United Nations Economic and Social Council has established links to set up an energy efficiency project to encourage, create and apply energy saving technologies in Western Europe and in Central and Eastern Europe[18]. As part of this program, a former military barracks in Ralsko Czech Republic has become the center of a variety of display technologies; among other activities, a range of energy-related equipment had been produced among them can name the heat Measures for use in regional heating systems by Natural gas.

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B. review of the legal regime of Energy and Environmental Protection in European Union

European Union depends on outside borders of this country to supply its energy (more than 50%). Europe's energy dependence on foreign trade is one of the main problems to the EU. So the security of energy supply is a major challenge for European Union member states. In this framework in terms of legal, article 256 of "Proposed Constitution of the Union of Europe" has considered the issue of energy under the joint jurisdiction of "European union" and the member states. This energy policy in Europe caused competitions between EU member states and institutions of Europe, so that many stronger countries of European union as Germany and France compared to the rest of European Union have more independent Energy policy.

Weaker European Union member states such as Hungary and Poland Seek more support from country European Union countries, so that some of them suggested creating an "energy NATO" to attract extensive support of European Union from European Union members. About the internal energy market in Europe, "Free competition" is legally possible since July 2007 and European union members can trade energy freely within the borders of the EU[16]. In this regard the legal framework for the integration of large oil and gas companies in Europe were provided. And yet, the environmental concerns have been considered in Europe as one of the major factors in the energy policymaking for this union.

B.1. Energy and Environmental Protection in European Union

In general, environmental protection and energy are of the issues that the EU Member States share their policy making competence with European Union based on multilateral treaties. On the other hand, Outlook of Energy and Environment in European union is based on the principle of "solidarity". In other words, in environmental and energy policies, correlation approach between these two is the basic approach of the European Union. Accordingly European policies on the "correlation energy and the environment" are as follows:

1. Climate protection:

One of the key strategies of European Union in the preparation, distribution and consumption of energy is climate protection. Fighting climate change through the use of appropriate energy policies is one of the most important principles of European Union in this area. Based on the European Union's decision On March 8, 2007, EU Member States are required to take the necessary national measures to reduce greenhouse gases so that according to the Kyoto Protocol by 2012, meet the objectives set forth in it.

2. Using new and renewable energy: Exploitation and utilization of new energy instead of fossil fuels is one of EU policies on the protection of the environment. The use of nuclear energy, wind, etc is in order to achieve these goals. In this context, European Union member states agreed that by 2012 at least 20% of the energy consumption of the EU supply through new and renewable energies.

3. Exploitation of diversity of Energy resources: Due to the high dependence of European Union on resources of outside of its borders, the EU intends to adopt the policy of diversity of energy sources to reduce dependence on energy. Supporting the national policies of member states in order to provide energy, Freedom of information in the energy sector and transparency and information sharing on energy consumption is the European Union's policy in this regard.

4. Application of new technologies in reducing energy consumption: European Union by developing Regional programs seeks to encourage EU Member States to reduced energy consumption through application of new technologies. In this context Production units of European Union are required to replace fossil fuel-based products by renewable energy-based products with lower consumption. So using nuclear technology with lower consumption of energy has been encouraged in Europe.

5. Development of international cooperation in the field of energy and environment: One of the major initiatives in Europe is international cooperation with other states in Production, distribution and consumption of energy. In this regard, the European Union wants to expand international cooperation in the field of energy and environment through international organizations, international treaties and bilateral cooperation. In general, one of the main axes of the Union in recent years is focusing on Environment and Energy Talks by other states. In this context, International Cooperation of European Union with United States, Russia, China and OPEC, and some Latin American countries on energy has been environment.

6. Regional laws and regulations on energy and environmental protection: One of basic actions of European Union in the context of regional laws and regulations on Energy and Environment is approval "of the Energy Charter Treaty" in 1994. In addition to this treaty, Energy Charter Protocol on exploitation of energy and environmental protection which was in force since 16 April 1998 is another measure of the EU in line with regulation of energy and environmental protection[10]. Legal instruments have been adopted in line with the cooperation of European Union member-states, especially the cooperation between the weaker and stronger European Union countries on energy supply and environmental protection. In this framework, founding document of "Energy Community" was approved by EU member states on October 25, 2005 in Athens, and these states seek to create a regional energy market along with maintaining environmental concerns through establishment the above institutions.

B.2. Problems and challenges in the way of European Union on Energy and Environment

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One of the main problems of the European Union in adopting coordinate policies for utilizing energy and protecting Environment are more powerful states of the Union which are major obstacle of regional cooperation in this Union through adopting national policy in this regard. Economic and political competitions in European Union and the tendency of some EU member states to adopt national policies in this regard is major obstacle to EU in adopting and implementing coordinate policies in this regard[11]. The lack of coordinate strategy on adoption of a Continuing policy in engagement with the United States and Russia is another problem for the EU in Energy and Environmental Protection sector. In addition to that the economic crisis in Europe especially in Greece and Spain could face this union with new challenges on energy sources. Moreover, threatening Iran to sanctions and implementing sanctions against Iran can also be considered as a threat to energy supplies in Europe.

IV.CONCLUSION

According to the investigation of resources and uses of energy in Europe and Iran, the use of new energy resources not only will not reduce over coming years, but it will also face increases substantially. With regard to these requirements, we see in recent years that these resource markets gradually are converting from the local to the global.

In this regard, Europe's Union dependence to sources of energy outside of its borders, national competition among members of this union, lack of coordination between national energy policies and Environmental Protection, has led the Union to create a comprehensive program for applying energy and protecting the environment[14]; in addition, concerns about application of energy and Environmental Protection in terms of cross-border, influences the need for international cooperation both regional and global and the member states cannot act unilaterally in this case, Hence energy issue can show the Iran's position in diplomacy and international relations particularly in relation to EU. On the domestic level also given the prominent place of Iran in the field of energy, institutionalizing energy can have important achievements in order to meet the interests of our country more favorable and can have the leading role in shaping the process and the rights of country's energy. For this purpose, and since the rules and regulations are the major tools of management and that existing regulations have their shortcomings, in the following, some cases that their inclusion in the Rules and Regulations can be beneficial are referred to:

1. Development of application of renewable energy in order to diversify the country's energy resources including hydro, wind, geothermal plants, and so on.

2. Rationalization of consumption patterns and cooperation with international organizations such as UNDP and membership of international protocols and conventions in order to use their special privileges.

3. Developing a comprehensive application of renewable energies.

4. Providing public and professional education, notification and information.

Existing legal perspectives in order to control the resources and energy consumption in different parts of the country are required to optimize supply and consumption of energy so that without reduction in the level of national output and welfare ensures prevention of energy loss, Increasing their efficiency and productivity, Protection of energy resources, contributing to sustainable development and protection of the environment, here's a description of them:

Energy efficiency standards: Standards and technical specifications for energy consumption in systems, energy consuming processes and equipments are determined by the Ministry of Energy and Petroleum and after review and approval of a committee consist of representatives of mentioned ministries, planning and management organization, Institute of Standards and Industrial Research, EPA and relevant department or agency are communicated to all relevant institutions and the and announced to standards and industrial research institutes for implementation and monitoring. Approvals of committee should be mandatory as the standard and all the designers, consulting engineers, producers and importers of systems, processes and equipments of energy should be required to comply with standards and technical specifications announced by standards bodies and Industrial Research of Iran and to prepare and stick energy label on goods and their packaging.

Ministry of Housing and Urban Development Shall be obliged to while coordinating with the Ministry of Energy and Petroleum provide, prepare all codes, rules and regulations for energy saving in building and Urban Development in the accordance with relevant legislation and submit them for approval to the Supreme Council of Energy and that all the industries and institutions that their annual consumption of fuel is higher than usual and standard be required to establish energy management, Conduct an energy audit and take practices for energy efficiency. In this regard and to reduce energy consumption intensity in the transport sector the following activities may be helpful:

Develop special regulations for the production of fuel-efficient vehicles in the country, requiring automakers to install energy label, increasing public transport capacity.

Raising awareness of energy consumption: to enhance consumers' awareness of energy through education and awareness activities; the following steps can be applied: Preparing media advertising program to promote a culture of consumption, Printing brochure and publishing specialized books on optimization of energy consumption, training courses for energy optimization, placing energy optimization issues in school curricula, benefiting from the experience of developed countries on optimization of energy

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consumption also setting up a website on optimization of energy consumption and virtual education.

Structure: Committees such as the Committee of demand and energy optimization were established under the auspices of the Supreme Council of Energy, their duties and composition of these committees were determined by the Supreme Council of Energy. Also, in order to provide adequate facilities to implement solutions to optimize energy consumption, it can be helpful to create a fund as Iran Energy Efficiency Fund[2]. In addition, the statute, regulations and procedures of the Fund must be submitted by Demand and Energy Conservation Committee to Supreme Council of Energy for approval.

Finally, it is recommended that to take appropriate measures in respect to preparing laws, rules, regulations and standards for energy conservation in the country, collecting environmental charges and fines from the resources, centers and areas with environmental pollution and dependent on the production and consumption of energy and the adopting energy-related equipment standards, as a consequence, in addition to the promotion of scientific and technological capabilities, the necessary legal instruments provided within the framework of national and international rules[3]; so adopting "National Energy Charter" can be one of the most important tools for filling legal gaps on energy in our country.

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Evaluation of the most economic area to utilize the power of wind in Isfahan Province

Yavari Foroushani. Mohammad, Mousavifard. Sayedjalal., and Yavari Foroushani. Ali

Abstract — Currently, localization of wind power is investigated in Isfahan Province. to study establishment of a wind powerhouse in Isfahan Province, climate statistics of wind speed in four areas, Boroujen, Mourcheh Khort, Varzaneh and Moghar was received and then turbine power and finally the cost of electrical power unit were calculated for consumers by using an AV 928 2.5 MW turbine and using two-parameter Weibull distribution. The results showed that if investment of wind powerhouses in Isfahan Province is economically considered, the southern areas of the province are more cost-effective than others. Also, increasing the height of turbine base will decrease the power unit for consumers. In southern areas, the south-eastern area will also be the most proper area to investigate wind renewable energy.

Keywords— *cost, energy, renewable, wind, Weibull.*

I. INTRODUCTION

Climate change is a problem in today's world, which was occurred after the industrial revolution to produce electricity. The best solution which can be suggested to remove it is using resources renewable and compatible with environment, which wind power is one [1]. Increase of utilizing fossil energy, decrease of the existing resources and increase of environment pollution along with emission of greenhouse gases have led to create proper conditions to utilize renewable energies [2]. Using the technologies of wind energy in thousands of years refers to use of vertical-axis windmills in the borders of Iran and Afghanistan in 200 BC and use of horizontal-axis windmills refers to Poland and Mediterranean [5-3]. Date of using wind energy in Iran also refers to 900 AD. In that time, Iranians in Sistan area would use vertical-axis windmills for some works such as lifting water from wells and milling wheat.

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Ali Yavari Foroushani is with the Department of Earthquake Engineering, Khajeh Nasir University, Tehran, Iran (e-mail: Yavari.f2012@gmail.com).

Several centuries after Iranians, Chinese used windmills to pump well water and milling rice. Four areas in Iran have the most portion of covering the nation wind energy, which Isfahan is considered as one of these prone areas. Currently, all activities done in the nation have been planned to utilize huge turbines [6-8].

II. MATERALS AND METHODS

In the recent study, the statistics of wind speed in four areas, Varvaneh, Moghar, Boroujen and Mourcheh Khort was received, which almost cover five places, south, north, west and east of the province. Then, the turbine power was estimated in these four areas by using an AV928 2.5 MW turbine and two-parameter Weibull distribution. Finally, the most proper area to invest on renewable wind energy was proposed by calculating the cost of electrical energy unit and considering the geographical obstacles to establish huge wind powerhouses in the province.

In figure 1, the process of making decision to establish wind powerhouses can be seen.

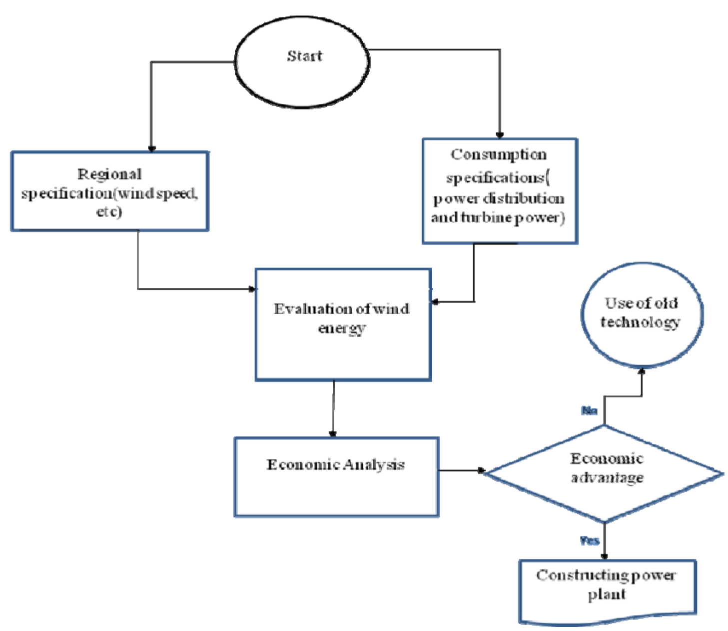

Figure (1): process of making decision to localize a proper area for wind energy systems

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III. STUDYING AREA

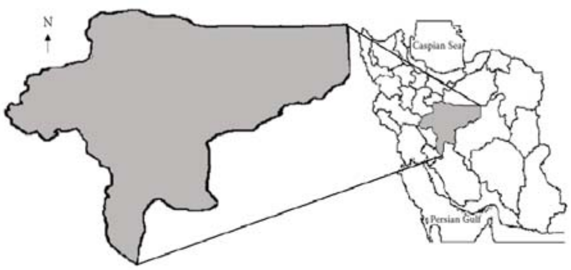

Figure (2): Isfahan Province

IV. STUDY BACKGROUND

The country Iran has had special plans in cross-national level; five-year plans of economic, social, cultural development, and has emphasized on renewable energies. In this regard, efforts to detect suitable areas and potential of wind energy in the cross-national level are planned as an unavoidable necessity for policy makers and regulators [9]. Accordingly, Organization of Renewable Energies started the plan of Atlas Bad of Iran from 2002 [10]. Some research has been also done on the methods of determining wind energy potential in Material and Energy Research Center (MERC) [11]. On the other hand, in Atlas project which was conducted in some weather station, two-parameter Weibull distribution was fitted with three-hour data of synoptic stations, and average wind speed cube was calculated [12-13].

V. CHARACTERISTICS of WIND AND WIND TURBINE

To determine the most suitable area to invest in wind energy, the energy potential must first estimated in every of the areas. According to the fact that wind speed has the most important role in the estimation of wind energy, therefore statistics and data of the areas have been studied to choose a proper location for wind powerhouses. In table (1), annual average wind speed which was prepared by Organization of Iran Renewable Energies is shown.

Table (1): average speed and rate of wind occurrence [14]

Target area	The mean wind speed at 10m height (m/s)	The winds occurrence rate with speeds of more than 4 meters per second	Number of readings
Varh	3.27	33%	1374
Brojn	2.83	27%	783
Moar	3.22	29%	635
More	3.02	22%	929

Average wind speed is used to estimate Weibull distribution. Weibull function is a special mode of the gamma which has more flexibility than others, and is defined as follow:

$$P(V) = \frac{K}{C}\left[\frac{V}{C}\right]^{K-1} \exp\left(-\left[\frac{V}{C}\right]^{K}\right) \quad (1)$$

Where

V is wind speed, K is a dimensionless parameter called shape factor and C is known as scale parameter. Weibull distribution's parameters of shape and scale are calculated by the following equation:

$$K = \left(\frac{\sigma}{\bar{V}}\right)^{-1.086} \quad (2)$$

$$C = \frac{\bar{V}}{\Gamma\left(1+\frac{1}{K}\right)} \quad (3)$$

Where

Γ is the gamma function, σ is standard deviation and $\bar{V}$ is average speed of wind in basic height (10 m). The obtained results for these two factors for different areas are shown in table (2).

Table (2): scale and shape factors in the areas [15]

Target area	C (scale parameter)	K(shape parameter)
Varzaneh	3.59	1.41
Brojen	3.1	1.3
Moqar	3.55	1.47
Morche	3.39	2.71

A. TURBINE POWER DETERMINATION

Production of electricity by a system converting wind energy depends on two factors, turbine characteristics and geographical conditions of the area. Blades are turbine characteristics. The longer blade is, the more contact surface of wind and a turbine is which causes increasing the speed of turbine blade rotation. Turbine power is calculated according two factors, speed and the surface swept by blades as follow:

$$P = \frac{1}{2}\rho A V^3 \quad (4)$$

Where

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ρ is air density which is almost 1 according to 1570 m height of Isfahan province from sea, A is cross section affected by wind and V is wind speed. Also, P is nominal power of the wind which is defined by Watt, and most often is used to estimate the generated power and substantially the cost of generated power unit. In the current study, as the wind speed is considered a changing factor in the above equation, existence of different methods to estimate density, average power $\bar{P}$ is used rather than nominal power. To calculate $\bar{P}$, calculation of average wind speed by the following equation is necessary:

(5) $$\overline{V^3} = C^3\Gamma\left(1+\frac{3}{K}\right)$$

Where

C and K are Weibull distribution parameters, Γ is gamma function and $\overline{V^3}$ is the cube of the mean wind speed. According to the aforesaid equations, the mean wind power can be rewritten as follow:

(6) $$\bar{P} = .3925\, D^2 C^3 \Gamma\left(1+\frac{3}{K}\right)$$

Where

D represents rotor diameter [16].

B. COST of GENERATED POWER

The cost of generated power is also effective to invest in the most suitable area. This factor will have an impact on choosing a system converting wind energy. This cost is calculated as follow:

(7) $$CPU = \frac{PVC}{E_{OUT}}$$

Where

PVC is the current value of the costs of a system converting wind energy and E_{OUT} is considered electrical energy as an output of wind turbines.

B.A. OUTPUT ELECTRICAL ENERGY

Two factors, turbine capacity and the rate of average energy generated by turbines are required to calculate output electrical energy.

(8) $$E_{OUT} = \bar{E} \times C_F$$

Where

$\bar{E}$ is the energy generated by a turbine during the life of the system and C_F is turbine capacity. Life of wind powerhouses is usually considered 20 years. The two factors can be calculated as follow:

(9) $$\bar{E} = 20 \times 365 \times 24 \times \bar{P}$$

Where

$\bar{E}$ is average electrical energy generated for total life of the system. The turbine capacity factor also depends on turbine specifications and geographical conditions of the area, which is calculated as follow:

(10) $$C_F = \frac{e^{-\left(\frac{v_i}{c}\right)^k} - e^{-\left(\frac{v_r}{c}\right)^k}}{\left(\frac{v_r}{c}\right)^k - \left(\frac{v_i}{c}\right)^k} - e^{-\left(\frac{v_0}{c}\right)^k}$$

Where

c and k are Weibull distribution parameters, v_i is minimum wind speed the turbine can generate, v_0 is maximum wind speed the turbine can generate and v_r is the nominal speed of the wind [17].

B.B. CURRENT VALUE OF COSTS

Current value of costs is a way to evaluate projects economically. To obtain current value of costs, the costs of investments, maintenance, residual value, interest rate and system lifetime are needed. This cost is calculated as follow:

(11) $$PVC = I + C_{omr}\left[\frac{(1+i)^n - 1}{i(1-i)^n}\right] - s\left[\frac{1}{(1-i)^n}\right]$$

Where

I- Includes all investment costs such as machines, equipment and civil actions

C_{omr} is costs of turbine maintenance during utilization, which is determined annually.
i is interest rate which is considered 22.6% in the current study according to the rate of inflation in 1936-2012 by Central Bank of Iran.
n is the lifetime of wind systems, which is considered 20 years.
s is residual value of the systems converting wind energy in the end of the system lifetime, which is considered 25% of the costs of turbines, site and installation, in the current study.
According to the above equations, it can be mentioned that the cost of the generated power unit depends on Weibull distribution parameters and rotor diameter. On the other hand, the scale parameter depends on the height of ground, therefore the scale parameter will change by changing height, as follow:

(12)

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$$c_2 = c_1\left(\frac{h_2}{h_1}\right)^{1/7}$$

Where

c_1 is the value of the scale parameter in the basic height *h1*, and c_2 is the value of the parameter in the height *h2*. Considering Weibull distribution parameters of wind speed for the areas and estimation of average generated power, the costs of the generated electrical power unit were calculated by the aforesaid equations in the following table. In the current study, calculation of generated electrical power price was done according to the latest changes of currency as 1 USD=25000 Rials [18].
Also, in the study, an AV 928-2.5 MW turbine connected to a network in class IIa made in Germany was used, the specifications of which are shown in table (3).

Table (3): AV 928-2.5 MW turbine specifications [19]

Rotor diameter	93.2 M
Swept area	6882 M2
Height of tower	80M, 90M
Nominal power	2.5 MW
Rate speed	11.6
Minimum wind speed to generate electricity	3 m/s
Maximum wind speed to generate electricity	25 m/s

Table (4): estimation of power unit cost to changes of basic height of turbine and the area [15-19]

CPU (Rial/kwh)	PVC ($)	E_{out} ($\times 10^6$) (kwh)	E ($\times 10^6$) (kwh)	P (w)	c_p	C (m/s)	h (m)	Area
921.3	686472.82	18.627823	117.15612	668699.29	.159	4.17	80	Borojen
893.2	721614.75	20.197528	123.15566	702943.25	.164	4.24	90	
755.1	890119.84	29.471315	151.91399	867089.00	.194	4.83	80	Varzaneh
732.4	935086.72	31.917646	159.58823	910891.73	.200	4.91	90	
805.5	794666.25	24.664981	135.52187	773526.68	.182	4.78	80	Moghar
779.2	834613.78	26.778877	142.44084	813018.48	.188	4.86	90	
2482.8	348449.93	3.508661	59.468831	339433.97	.059	4.56	80	Mourcheh Khort
2325.1	367113.1	3.947202	62.654003	357614.17	.063	4.64	90	

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VI. FINDING LOCATION OF WIND ENERGY

To find the most suitable place among the mentioned areas in the province, the criteria are distance from cities and populated places, roads, airports, areas protected by Environmental Protection Agency of Iran as well as wetlands. Studies show that wind powerhouses must at least be as far as 2000 meters from cities and 500 meters from populated areas because they are affected by powerhouses due to noises and security. About the distance of transportations ways from wind powerhouses, it should be cited that research of advanced countries on generation of wind power implies the distances of minimum 250 meters from railways, 3000 meters from highways and 500 meters from local roads. Also, because wind turbines transmit some noises to the main radars of airports and airplanes, standard distance of minimum 15000 meters from military airports and 2500 meters from local airports is shown in the studies. Wind turbines have some effects on protected areas, and because it effects on the inherent feature of nature negatively, minimum distance considered to install wind turbines from these areas is 2000 meters. Wetlands are also habitats of birds in different seasons, therefore it should be attempted to install wind turbines in the minimum distance of 500 meters from wetlands [20]. There is no certain distance to install wind turbines from earthquake faults, so fat, but it is obvious that seismicity of areas should be considered when installing.

VII. CONCLUSION

The current study shows that wind speed in southern areas of the province is higher than other areas. According to the calculations, it is concluded that if there is any investment in establish wind powerhouses, the price of energy unit in Vazaneh is less than others. If investment of wind powerhouses in Isfahan province is economically considered, southern areas of the province will have less cost for the government. Also, increase of basic height of turbines will decrease the cost of power unit for consumers. About a suitable place, according to the restrictions, middle areas of the province due to airports, railways as well as populated centers will not be suitable to utilize wind energy. The protected areas have been also considered to establish wind powerhouses. In the case of wildlife shelters, Mouteh and Karkas in west north of the province, the wildlife shelter Ghomshloo in the center of the province and the park Melli located in southeast of the province should be considered. Wetlands are also important after the protected areas. The only wetland of Isfahan province is Gavkhooni located at 167 Km from southeast of the province. According to the descriptions, south areas of the province can be the most suitable area economically and locally to invest on this energy. Of course, south areas have also some restrictions which should be done to remove investment obstacles. Of seismicity point of view, according to the map of earthquake-prone areas of Iran, we find out that southwest of Isfahan province are the areas of moderate and high earthquake risk, but southeast of the province is considered as low risk one. According to the analysis done on north, central, eastern and south areas, southeast areas of Isfahan province will be the most suitable ones to invest on renewable wind energy, which broader research should be done on how to utilize them exactly.

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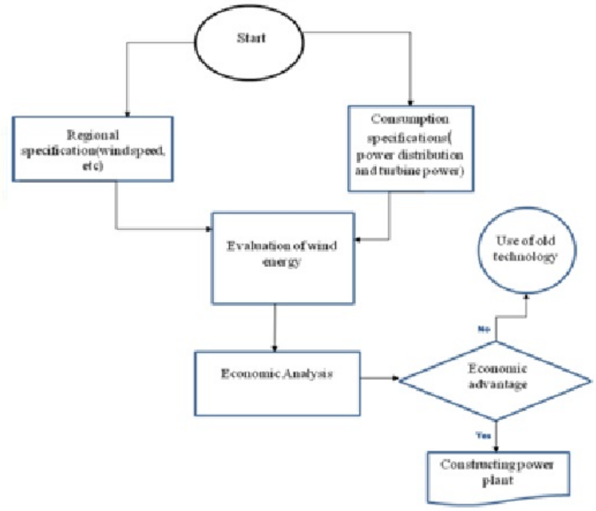

Fig. 1 process of making decision to localize a proper area for wind energy systems

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III. STUDYING AREA

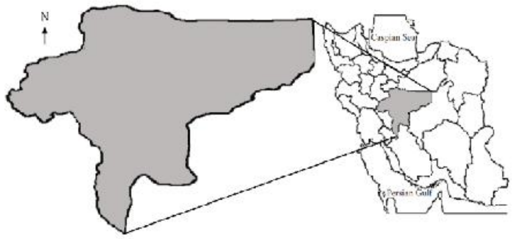

Fig. 2 Isfahan Province

IV. STUDY BACKGROUND

The country Iran has had special plans in cross-national level; five-year plans of economic, social, cultural development, and has emphasized on renewable energies. In this regard, efforts to detect suitable areas and potential of wind energy in the cross-national level are planned as an unavoidable necessity for policy makers and regulators [9]. Accordingly, Organization of Renewable Energies started the plan of Atlas Bad of Iran from 2002 [10]. Some research has been also done on the methods of determining wind energy potential in Material and Energy Research Center (MERC) [11]. On the other hand, in Atlas project which was conducted in some weather station, two-parameter Weibull distribution was fitted with three-hour data of synoptic stations, and average wind speed cube was calculated [12-13].

V. CHARACTERISTICS of WIND AND WIND TURBINE

To determine the most suitable area to invest in wind energy, the energy potential must first estimated in every of the areas. According to the fact that wind speed has the most important role in the estimation of wind energy, therefore statistics and data of the areas have been studied to choose a proper location for wind powerhouses. In table (1), annual average wind speed which was prepared by Organization of Iran Renewable Energies is shown.

Table. 1 average speed and rate of wind occurrence [14]

Target area	The mean wind speed at 10m height (m/s)	The winds occurrence rate with speeds of more than 4 meters per second	Number of readings
Varzaneh	3.27	33%	1374
Boroujen	2.83	27%	783
Moghar	3.22	29%	635
Mourcheh Khort	3.02	22%	929

Average wind speed is used to estimate Weibull distribution. Weibull function is a special mode of the gamma which has more flexibility than others, and is defined as follow:

$$P(V) = \frac{K}{C}\left[\frac{V}{C}\right]^{K-1} exp\left(-\left[\frac{V}{C}\right]^{k}\right) \quad (1)$$

Where

V is wind speed, K is a dimensionless parameter called shape factor and C is known as scale parameter. Weibull distribution's parameters of shape and scale are calculated by the following equation:

$$K = \left(\frac{\sigma}{\bar{V}}\right)^{-1.086} \quad (2)$$

$$C = \frac{\bar{V}}{\Gamma\left(1+\frac{1}{K}\right)} \quad (3)$$

Where

Γis the gamma function, σ is standard deviation and $\bar{V}$ is average speed of wind in basic height (10 m). The obtained results for these two factors for different areas are shown in table (2).

Table. 2 scale and shape factors in the areas [15]

Target area	C (scale parameter)	K(shape parameter)
Varzaneh	3.59	1.41
Boroujen	3.1	1.3
Moghar	3.55	1.47
Mourcheh Khort	3.39	2.71

A. TURBINE POWER DETERMINATION

Production of electricity by a system converting wind energy depends on two factors, turbine characteristics and geographical conditions of the area. Blades are turbine characteristics. The longer blade is, the more contact surface of wind and a turbine is which causes increasing the speed of turbine blade rotation. Turbine power is calculated according two factors, speed and the surface swept by blades as follow:

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$$P = \frac{1}{2}\rho A V^3 \quad (4)$$

Where

ρ is air density which is almost 1 according to 1570 m height of Isfahan province from sea, A is cross section affected by wind and V is wind speed. Also, P is nominal power of the wind which is defined by Watt, and most often is used to estimate the generated power and substantially the cost of generated power unit. In the current study, as the wind speed is considered a changing factor in the above equation, existence of different methods to estimate density, average power $\bar{P}$ is used rather than nominal power. To calculate $\bar{P}$, calculation of average wind speed by the following equation is necessary:

$$V^3 = C^3\Gamma\left(1+\frac{3}{K}\right) \quad (5)$$

Where

C and K are Weibull distribution parameters, Γ is gamma function and $\bar{V}^3$ is the cube of the mean wind speed. According to the aforesaid equations, the mean wind power can be rewritten as follow:

$$\bar{P} = .3925\, D^2 C^3 \Gamma\left(1+\frac{3}{K}\right) \quad (6)$$

Where

D represents rotor diameter [16].

B. COST of GENERATED POWER

The cost of generated power is also effective to invest in the most suitable area. This factor will have an impact on choosing a system converting wind energy. This cost is calculated as follow:

$$CPU = \frac{PVC}{E_{OUT}} \quad (7)$$

Where

PVC is the current value of the costs of a system converting wind energy and E_{OUT} is considered electrical energy as an output of wind turbines.

B.A. OUTPUT ELECTRICAL ENERGY

Two factors, turbine capacity and the rate of average energy generated by turbines are required to calculate output electrical energy.

$$E_{OUT} = \bar{E} \times C_F \quad (8)$$

Where

$\bar{E}$is the energy generated by a turbine during the life of the system and C_F is turbine capacity. Life of wind powerhouses is usually considered 20 years. The two factors can be calculated as follow:

$$\bar{E} = 20 \times 365 \times 24 \times \bar{P} \quad (9)$$

Where

$\bar{E}$is average electrical energy generated for total life of the system. The turbine capacity factor also depends on turbine specifications and geographical conditions of the area, which is calculated as follow:

$$C_F = \frac{e^{-\left(\frac{v_i}{c}\right)^k} - e^{-\left(\frac{v_r}{c}\right)^k}}{\left(\frac{v_r}{c}\right)^k - \left(\frac{v_i}{c}\right)^k} - e^{-\left(\frac{v_0}{c}\right)^k} \quad (10)$$

Where

C and k are Weibull distribution parameters, v_i is minimum wind speed the turbine can generate, v_0 is maximum wind speed the turbine can generate and v_r is the nominal speed of the wind [17].

B.B. CURRENT VALUE OF COSTS

Current value of costs is a way to evaluate projects economically. To obtain current value of costs, the costs of investments, maintenance, residual value, interest rate and system lifetime are needed. This cost is calculated as follow:

$$PVC = I + C_{omr}\left[\frac{(1+i)^n - 1}{i(1-i)^n}\right] - S\left[\frac{1}{(1-i)^n}\right] \quad (11)$$

Where

I- Includes all investment costs such as machines, equipment and civil actions

C_{omr} is costs of turbine maintenance during utilization, which is determined annually.
i is interest rate which is considered 22.6% in the current study according to the rate of inflation in 1936-2012 by Central Bank of Iran.
n is the lifetime of wind systems, which is considered 20 years.
s is residual value of the systems converting wind energy in the end of the system lifetime, which is considered 25% of the costs of turbines, site and installation, in the current study.
According to the above equations, it can be mentioned that the cost of the generated power unit depends on Weibull

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distribution parameters and rotor diameter. On the other hand, the scale parameter depends on the height of ground, therefore the scale parameter will change by changing height, as follow:

$$C_2 = C_1 \left(\frac{h_2}{h_1}\right)^{1/7}$$

C1 is the value of the scale parameter in the basic height *h1*, and c_2 is the value of the parameter in the height *h2*. Considering Weibull distribution parameters of wind speed for the areas and estimation of average generated power, the costs of the generated electrical power unit were calculated by the aforesaid equations in the following table. In the current study, calculation of generated electrical power price was done according to the latest changes of currency as 1 USD=25000 Rials [18]. Also, in the study, an AV 928-2.5 MW turbine connected to a network in class IIa made in Germany was used, the specifications of which are shown in table (3).

Table. 3 AV 928-2.5 MW turbine specifications [19]

Rotor diameter	93.2 M
Swept area	6882 M2
Height of tower	80M, 90M
Nominal power	2.5 MW
Rate speed	11.6
Minimum wind speed to generate electricity	3 m/s
Maximum wind speed to generate electricity	25 m/s

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Table. 4 estimation of power unit cost to changes of basic height of turbine and the area [15-19]

CPU (Rial/kwh)	PVC ($)	$\bar{E}_{out}(\times 10^6)$ (kwh)	$\bar{E}(\times 10^6)$ (kwh)	$\bar{P}$ (w)	c_F	C (m/s)	h (m)	Area
921.3	686472.82	18.627823	117.15612	668699.29	.159	4.17	80	Boroujen
893.2	721614.75	20.197528	123.15566	702943.25	.164	4.24	90	
755.1	890119.84	29.471315	151.91399	867089.00	.194	4.83	80	Varzaneh
732.4	935086.72	31.917646	159.58823	910891.73	.200	4.91	90	
805.5	794666.25	24.664981	135.52187	773526.68	.182	4.78	80	Moghar
779.2	834613.78	26.778877	142.44084	813018.48	.188	4.86	90	
2482.8	348449.93	3.508661	59.468831	339433.97	.059	4.56	80	Mourcheh Khort
2325.1	367113.1	3.947202	62.654003	357614.17	.063	4.64	90	

VI. FINDING LOCATION OF WIND ENERGY

To find the most suitable place among the mentioned areas in the province, the criteria are distance from cities and populated places, roads, airports, areas protected by Environmental Protection Agency of Iran as well as wetlands. Studies show that wind powerhouses must at least be as far as 2000 meters from cities and 500 meters from populated areas because they are affected by powerhouses due to noises andsecurity.About the distance of transportations ways from wind powerhouses,it should be cited that research of advanced countries ongeneration of wind power implies the distances of minimum250 meters from railways, 3000 metersfromhighways and 500 meters from local roads. Also, because wind turbines transmit some noises to the main radars of airports and airplanes, standard distance of minimum 15000 meters from military airports and 2500 meters from local airports is shown in the studies. Wind turbines have some effects on protected areas, and because it effects on the inherent feature of nature negatively, minimum distance considered to install wind turbines from these areas is 2000 meters. Wetlands are also habitats of birds in different seasons, therefore it should be attempted to install wind turbines in the minimum distance of 500 meters from wetlands [20]. There is no certain distance to install wind turbines from earthquake faults, so fat, but it is obvious that seismicity of areas should be considered when installing.

VII. CONCLUSION

The current study shows that wind speed in southern areas of the province is higher than other areas. According to the calculations, it is concluded that if there is any investment in establish wind powerhouses, the price of energy unit in Varzaneh is less than others. If investment of wind powerhouses in Isfahan province is economically considered, southern areas of the province will have less cost for the government. Also, increase of basic height of turbines will decrease the cost of power unit for consumers. About a suitable place, according to the restrictions, middle areas of the province due to airports, railways as well as populated centers will not be suitable to utilize wind energy. The protected areas have been also considered to establish wind powerhouses. In the case of wildlife shelters, Mouteh and Karkas in west north of the province, the wildlife shelter Ghomshloo in the center of the province and the park Melli located in southeast of the province should be considered. Wetlands are also important after the protected areas. The only wetland of Isfahan province is Gavkhooni located at 167 Km from southeast of the province. According to the descriptions, south areas of the province can be the most suitable area economically and

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locally to invest on this energy. Of course, south areas have also some restrictions which should be done to remove investment obstacles. Of seismicity point of view, according to the map of earthquake-prone areas of Iran, we find out that southwest of Isfahan province are the areas of moderate and high earthquake risk, but southeast of the province is considered as low risk one. According to the analysis done on north, central, eastern and south areas, southeast areas of Isfahan province will be the most suitable ones to invest on renewable wind energy, which broader research should be done on how to utilize them exactly.

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