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Optimizing Consumption of Energy In Building Part

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ABSTRACT

Background: Now, building part is the largest one that consumes energy in every country. Using energy in home part in 2010 has been over 424/1 million barrels equivalent to petroleum that is about 40/6% of total that is used in Iran. Using energy in building part in Iran is more than other countries. **Objective:** According to above statements increasing efficiency of energy, consumer's equipments and decreasing waste of energy is very important for the country. For this purpose this article reviewes the optimization consumption energy in Iran. **Results:** results of this paper show that some activities in fields Two fold glass, window, profile and Insulator of thermal are doing in different cities of Iran. That these activities can save energy. **Conclusion:** the activities in building part for saving energy shows that are some attempts in this way with a more rapid speed and these attempts have could saving great amount of energy.

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INTRODUCTION

The concept of energy and its transformations is vital in explaining and predicting most natural phenomena. One form of energy can often be readily transformed into another; for instance, a battery, from chemical energy to electric energy; a dam: gravitational potential energy to kinetic energy of moving water (and the blades of a turbine) and ultimately to electric energy through an electric generator (Balance sheet of energy, 2010).

There are strict limits to how efficiently energy can be converted into other forms of energy via work, and heat as described by Carnot's theorem and the second law of thermodynamics. These limits are especially evident when an engine is used to perform work. Some energy transformations can be quite efficient (Balance sheet of energy, 2010).

The direction of transformations in energy (what kind of energy is transformed to what other kind) is often described by entropy (equal energy spread among all available degrees of freedom) considerations, as in practice all energy transformations are permitted on a small scale, but certain larger transformations are not permitted because it is statistically unlikely that energy or matter will randomly move into more concentrated forms or smaller spaces.

Energy transformations in the universe over time are characterized by various kinds of potential energy that has been available since the Big Bang, later being "released" (transformed to more active types of energy such as kinetic or radiant energy), when a triggering mechanism is available. Familiar examples of such processes include nuclear decay, in which energy is released that was originally "stored" in heavy isotopes (such as uranium and thorium), by nucleosynthesis, a process ultimately using the gravitational potential energy released from the gravitational collapse of supernovae, to store energy in the creation of these heavy elements before they were incorporated into the solar system and the Earth. This energy is triggered and released in nuclear fission bombs or in civil nuclear power generation (Energy information, 2003).

Similarly, in the case of a chemical explosion, chemical potential energy is transformed to kinetic energy and thermal energy in a very short time. Yet another example is that of a pendulum. At its highest points the kinetic energy is zero and the gravitational potential energy is at maximum. At its lowest point the kinetic energy is at maximum and is equal to the decrease of potential energy. If one (unrealistically) assumes that there is no friction or other losses, the conversion of energy between these processes would be perfect, and the pendulum would continue swinging forever (Reid, 2001 and AEOI, 2002).

Energy gives rise to weight when it is trapped in a system with zero momentum, where it can be weighed. It is also equivalent to mass, and this mass is always associated with it. Mass is also equivalent to a certain amount of energy, and likewise always appears associated with it, as described in mass-energy equivalence. The formula

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$E = mc^2$, derived by Albert Einstein quantifies the relationship between rest-mass and rest-energy within the concept of special relativity. Matter may be converted to energy (and vice versa), but mass cannot ever be destroyed; rather, mass/energy equivalence remains a constant for both the matter and the energy, during any process when they are converted into each other. However, since c^2 is extremely large relative to ordinary human scales, the conversion of ordinary amount of matter (for example, 1 kg) to other forms of energy (such as heat, light, and other radiation) can liberate tremendous amounts of energy (~9×10^{16} joules = 21 megatons of TNT), as can be seen in nuclear reactors and nuclear weapons. Conversely, the mass equivalent of a unit of energy is minuscule, which is why a loss of energy (loss of mass) from most systems is difficult to measure by weight, unless the energy loss is very large. Examples of energy transformation into matter (i.e., kinetic energy into particles with rest mass) are found in high-energy nuclear physics.

Method:

National rules of building have common principles and should be obeyed and performed all over the country. They supervise any activity that is done in this part such as: building, destroying, changing the design and usage of the building and so on. In direction of performing laws of building, part 19 (saving energy in non-governmental buildings), optimizing energy consumption Company has done the following activities:

- Optimizing activities in municipalities: this project has been done with the aim of obligating performance of the special law about building in all parts. From the activities that have been done in this relation, the following ones are noticeable: supervising and consulting on performing part 19 through performing and creating offices of optimizing energy in municipalities, presenting practical ways for optimizing energy in building through making a sample building, promoting using optimized construction materials that can protect the building and insulate it through a permanent exhibition of construction materials, being familiar with ways of preventing energy wasting in present buildings and presenting ways of controlling energy consumption through controlling some governmental and public buildings.

This project has been done in more than 29 municipalities all over the country. These are: Ashkhaneh, Abhar, Asadabad, Zanjan, Samen, Sabzevar, Semnan, Qazvin, Kermanshah, Kashan and Manjil. This project has been ended in 2010 (Balance sheet of energy, 2010).

Results:

Table 1: Activities that have been done in the field of performing part 19 about national rules of building and the amount of saving to the end of 2010.

Kind of project	product		Quantity of saving of natural gas	Quantity of saving of energy
	Amount	unite		
Two fold glass	70000	M^2	16/67	1/12
window	100000	M^2	22	2/2
profile	7200	Ton	22	158/4
Insulator of thermal	1455792	M^2	3/3-5/09	5/8

Approved standards in building part and equipment that use energy:

In 2010 standard of using energy in building for preparing suitable pattern of building and determining exact amount of energy consumption in buildings was prepared by ministry of oil, but it hasn't been approved to the end of 2010. So, from the other activities of this ministry for providing standards for energy consuming equipments to the end of 2010; we can name the following ones:

Standard of instant gas-burning water heater, gas-burning heater with chimney and gas-burning heater without chimney. It has been estimated that in case of performing standards for instant gas-burning water heater and gas-burning heater with chimney the amount of saving in 2010 has been about 471/5 million cubic meters of natural gas. Unfortunately there isn't any careful estimation about present consuming of gas-burning heater without chimney.

Other activities that have been done in building part and for energy consumer equipments of homes:
Companies following oil ministry:

Performing guidelines of optimizing in mechanical equipments of buildings of oil Co in order to improve the pattern of consumption in these series of buildings, 37 building were chosen with high consumption and some activities were started in them. These activities were:

Installing intelligent system in engine room, installing thermostat valves of radiators, installing water pipes that carry and return warm water, installing insulating builers and collectors, insulating water sources and **. It is anticipated that by doing the above guidelines they can save about 550000 cubic meters of natural gas yearly.

Table 2: Presenting approved standards in parts of building and energy consumer equipments in ministry of oil in 2010.

Name standard	Present condition	Target condition	Product of year	Determining of deal of

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	M^3 gas in year			saving energy
Instant gas-burning water heater	940	510	250000	107/5
Gas-burning heater with chimney	1300	845	800000	364
Gas-burning heater without chimney	-	350	250000	-

Table 3: Estimating yearly saving of energy because of standardizing energy consumer equipments at homes during different years.

Device	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Refrigerator freezer	23	46	81	119	143	150	157	227	260	296	334	351
Auto washing machine	-	-	-	2	2	3	5	7	8	14	18	24
compressor	-	-	-	2	3	4	5	7	10	13	16	20
Cooler	-	-	-	-	-	34	36	53	107	127	154	162
Electrical Samavar	-	-	-	-	-	-	-	-	-	-	-	-
Electrical iron	-	-	1	1	1	1	1	1	2	2	2	2
Electrical heater	-	-	1	1	2	2	3	3	3	3	5	5
Electrical heater of water	-	-	4	5	5	5	5	6	7	8	10	12
Compaction heater	-	-	-	3	3	3	3	3	3	3	3	3
Electrical lump	-	-	-	-	612	686	784	1763	3919	5388	7886	11021
pump	-	-	2	4	4	4	4	7	7	7	10	10
cooler	-	-	-	-	21	26	31	37	44	50	56	63
Electromotor	-	-	-	-	-	-	44	44	69	72	101	133
Electromotor	-	-	-	-	-	-	-	94	147	206	217	284
Electrical balast	-	-	-	-	-	-	-	10	16	21	22	28
fan	-	-	-	-	-	-	-	-	1	1	2	2
refrigerator	-	-	-	-	-	-	-	-	14	14	15	19
Electrical sweep	-	-	-	-	-	-	-	-	-	15	17	18
Vacuum cleaner	-	-	-	-	-	-	-	-	-	-	67	67
cooler	-	-	-	-	-	-	-	-	-	68	89	119
Cooler bridge	-	-	-	-	-	-	-	-	-	-	3	3
Fan	-	-	-	-	-	-	-	-	-	-	3	6

Companies following power ministry:

Performing projects relating with DSM by coordinating of assistance office in Tavanir Co and the help of scientific and research centers of the country such as; Tarbiat Modares university, Niroo Research center, Saba, the university of water and power industry and so on.

- Measuring possibility project and designing electrical water heater equipped with heating pump. Its aim is measuring the possibility of using such water heaters in different sites and then making and producing such heaters in the country.
- Using solar energy system connected to network with the power of 7/5 Kilowatt in the building No 4. Its aim is using renewable energies and reducing energy consumption in the building.
- Determining standard of consumption on commercial part.
- Replacing three lines of producing fluorescent lamp T10 instead of T8 with capacity of 14 million ones in a year. In 2010, over 120 million lamps have been using in the country and about 30 million ones have been replaced with old ones. In this project by supporting two main internal companies that produce fluorescent lamps, three lines that produce T10 will change to T8 lamps. In the case of performing these two designs, three production lines of the factory will be changed. They produce 14 million T8 lamps yearly and provide needs of the country. By replacing each T8 lamp with T10, about 5 kilowatt hour of energy is saved yearly. By producing the total of lamps, about 69 Gigawatt hours energy is saved yearly.
- Supporting promotion of energy rank of 940000 freezers and refrigerators to A and B ranks. In 2010 among 940000 freezers and refrigerators, about 210000 of them has had A rank and 730000 has had B rank. Saving potential of these 940000 ones has been 213 Gigawatt hours yearly and returning of capital is has been possible during 11/5 months.
- Supporting promotion of EER for 223000 water cooler for producing coolers with ranks of A and B. in 2010, 223000 water coolers with A and B ranks were produced. Potential of saving energy of these coolers are 60 Gigawatt hours yearly and returning of capital will be possible during 9 months.

Table 4: Estimating lowering yearly peak hours as a result of standardizing energy consumer equipments at homes during different years.

Device	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010

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Refrigerator freezer	2941	4904	8583	12616	15140	15897	16692	24098	27604	31399	35505	37280
Auto washing machine	-	-	-	288	302	476	833	1050	1286	2123	2837	3617
compressor	-	-	-	1007	1343	2014	2538	3331	4664	6121	7712	9448
Cooler	-	-	-	-	-	5361	5629	8344	16793	19932	24149	25356
Electrical Samavar	-	-	-	-	-	-	-	-	-	-	113	225
Electrical iron	-	-	575	600	625	975	1050	1088	1500	1550	1600	2063
Electrical heater	-	-	313	344	375	406	656	703	750	797	1125	1188
Electrical heater of water	-	-	408	429	450	472	496	521	656	689	905	1140
Compaction heater	-	-	-	516	528	540	552	564	588	600	600	600
Electrical lump	-	-	-	-	24000	26880	30720	69120	153600	211200	309120	432000
pump	-	255	248	518	540	554	572	878	911	945	1305	1350
cooler	-	-	-	-	880	1089	1320	1573	1852	2107	2383	2680
Electromotor	-	-	-	-	-	-	993	993	1565	1643	2300	3019
Electromotor	-	-	-	-	-	-	-	7386	11633	16286	17100	22444
Electrical balast	-	-	-	-	-	-	-	4080	6243	8490	8660	11042
fan	-	-	-	-	-	-	-	-	89	187	235	247
refrigerator	-	-	-	-	-	-	-	-	124	130	137	172
Electrical sweep	-	-	-	-	-	-	-	-	-	1440	1620	1800
Vacuum cleaner	-	-	-	-	-	-	-	-	-	-	64	64
cooler	-	-	-	-	-	-	-	-	-	21905	28750	38333
Cooler bridge	-	-	-	-	-	-	-	-	-	-	31	31
Fan	-	-	-	-	-	-	-	-	-	-	360	800

Table 5: Amount of energy saving potential from credits of 2010 in energy efficiency organization of Iran.

Approved projects in building commitee	Potential of saving energy
Replacing three lines that produce T10 lamp with T8 ones with the capacity of 14 million ones yearly	69000
Supporting promotion of energy rank of ……	213000
Supporting promotion of EER for producing water coolers	60000
Total	342000

Conclusion:

Now, building part is the largest one that consumes energy in every country. Using energy in home part in 2010 has been over 424/1 million barrels equivalent to petroleum that is about 40/6% of total that is used in Iran. In above paragraph mentioned some of activities in building part that are for saving energy in this part, reviewing these activities shows that are some attempts in this way with a more rapid speed.

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