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Research Article

Conversion of Brackish Water with Solar Desalinization Technique in Coastal Belt of Lasbella Gadhani, Balochistan, Pakistan

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Abstract

Drinking water is essential necessitate for daily life as there is dearth of water in many parts globally. Water quality ought to be such that it can be used by persons for drinking purpose. There are already plenty of solar units present in the market that can do reclamation process, as the available desalinization solar units clean the water safe to drink In desalination process the removal of salt and other minerals from the water is carried out to make it suitable for human consumption and industrial use. Reverse Osmosis (RO) is a single frequently used household filtration system that cleans flush every contamination. RO is requisite if the Total Dissolved Solids (TDS) exceeds a certain value (2000 - 3000 ppm). The main objective of this project is to use the sun as source of energy through solar desalinization technique which cleans water for drinking purpose and installed three or four desalinization solar units at village level that operates on solar power. The desalinization solar units performed better results if intake water adjustment was done @6 liters/hr/panel). The brackish water having 4.27 dSm-1 salts through solar desalinization technique reduced the toxic salts to 0.21dSm-1 at Goth Bashirullah, Gadani, Lasbela, Baluchistan. Water having so minute salts is fit for drinking purpose. This system creates awareness to the local communities.

Keywords: RO (Reverse Osmosis); TDS (Total Dissolved Solids); Desalination Solar Units

Introduction

Lasbela is gifted agricultural land [1]. It is situated between latitude 25° 18'N to 26° 14'N and longitude 66° 06'E to 66° 40'E. Three angled wrought re-participant plain of Lasbela is the consequence of the alluvium deposits of the Porali River and its distributaries [2]. It has about 64 km width next to its foot and tapers north for regarding 88 km beside the braided Porali River. Droughtiness shared with tough south-west winds follow-on broad coastal sand hill strap whose sea-ward borders are created by long fine beaches [3]. Approximately 6% of whole land of Lasbela district is in agriculture while 71.4% of the full land is considered as cultivation waste [4]. Food safety of the inhabitants can be gained by civilizing the crop yield, discovering and using fertile soil by adapting current techniques. Enduring arrangement and managing of this district could supply the lasting effect in the entire area. Suitable utilization of assets and excellent supervision can make better the saving of the local population with the entire area. Durable water supervision plan will too convene an enduring requisite of Balochistan province for passable necessities of water, mainly in the sight of the increasing land of fruit orchards [5].

The reduction of groundwater is a apparition offered for many parts of the world that depend on the un managed utilization of groundwater. Groundwater irrigation has been a key strength after the remarkable raise in food productivity in South Asia. The consistency and suitability of groundwater exploit and the supplementary water it brought has ended it a vital part of the region's green revolution since the 1970s. However, groundwater is also the world's 'mainly mined reserve' [6,7]. Over recent decades, groundwater use has grown exponentially in scale and passion in many places, principal to aquifer depletion and groundwater pollution [8-10]. The National Academy of Sciences (2012) for example in its report on glacier melt in the Himalayan asserted that groundwater over use was a bigger problem in the Indo Gangetic Basin than the melt together with climate change and air pollution. In Pakistan, the decline in water tables outside the canal areas is a menace to sustain irrigated agriculture. The potable water is accessible in

patches. Frequently water is saline in nature. So, there is shortage of high-quality clean water in the cities and far-off areas. Solar power-driven water desalination is ever more suitable a cutthroat way out for supplying drinking-water in many countries approximately the world. The desalination of saline water has been accepted as one of the most sustainable and fresh water resource alternate. It acts a significant part in the socio-economic progress for many communities and industrialized sectors. At present there are more than 14,000 desalination plants in function universally clearing out a number of billion gallons of saline water per day. 57% are in the Middle East and Gulf region where large scale predictable heat and power plants are installed. The amalgamation of renewable energy assets in desalination and water distillation is fetching more workable as expenses of conservative systems increase, commitments to reduce greenhouse gas releases are implemented and targets for exploiting renewable energy are put. As a result, solar energy could provide a sustainable substitute to impel the desalination plants, particularly in countries which recline on the solar strap for instance Africa, the Middle East, India, Pakistan and China.

Stipulation of secure drinking water is an imperative for the life and domino effect in socio-economic development. Fresh water resources are rapidly declining due to increase of the population and mismanagement and the emerging climate changes are further accelerating the process of water scarcity. This is a need of the time to use saline water drinkable particularly in the coastal areas which have lowest access to the safe drinking water and ground water is often brackish. The coastal population is prone to a number of health problems because of using perilous water.

Conservative techniques applied for disinfection of brackish water comprise ozonation, chlorination and artificial UV radiation. These technologies are money demanding, involve complicated apparatus and require trained operators (Acher., *et al*. 1997; Pelizzetti, 1999; U.S. Environmental Protection Agency, 1996). Germ-infested water spreads an expected 6 to 60 billion cases of gastrointestinal illness annually. Almost each and every one of these cases take place in rural areas of developing nations where the water supply is contaminated with a assortment of microorganisms, counting viruses, fecal coliforms and protozoa and sufficient cleanliness is out of reach. The call for a low-cost, low-maintenance and effective disinfection system for the improvement of water quality is far above the ground. Boiling, for example, requires about 1 kg of wood/liter of water and maltreatment of sodium hypochlorite solution causes a shelter exposure [11].

Experiment Procedure/Design

Solar generated water desalination system AROCELL purifies Australian technology. It merely utilizes sun energy with no moving parts and electronics. It is full-bodied and simple to install, low upholding and very low in running cost for the reason that the water cleanser only requires solar energy. The intake water is abounding by gravity working at ambient temperature, heats the input water producing vapors compression change precluding all bacteria and pathogens, so eradicating all water bearing diseases Introduction to ultra violet light and excessive heat from solar energy through the sophisticated combined panels promotes the germ homicide procedure. CAROCELL's augmented competence (65% with climax efficiencies higher than 80%) than other solar distillation products (30 - 40%) is a combination of the proprietary materials used to radically boost the temperature of the intake water on the solar antenna which increases the evaporation/condensation processes inside the panel. Moreover, this stylish geometrical devise has effortless maintenance, best concert and a self-controlling natural convection loop enabling commonly better energy recovery. Under this study 04 solar desalination units were installed at Goth Bashirullah, Gadani Lasbela, Baluchistan.

Figure 1: Alignment of poles for solar desalination mounted on pole.

Figure 2: Zero level of poles installation for desalination mounted on pole.

Figure 3: Train the farmers for operation and maintenance of solar desalination system.

Figure 4: Working of Solar Desalination System in Field Areas of Umerkot.

Figure 5: Four units of solar desalination system installed at Gadani, Hub, Balochistan.

Figure 6: Solar desalination and Drip in tunnel at Gadani Hub, Balochistan.

Results and Discussions

The distillation of saline water into drinkable water depends upon the intake brackish water capacity of each desalinization solar unit. During testing it was observed that intake water (saline water) should be adjusted @6 liters/hr/panel for the better working of the solar system. Data indicated in table 1 showed that 86 liters saline water provided the maximum drinkable water at the adjustment @6 liters/hr/panel at Goth Bashirullah, Gadani, Lasbela, Baluchistan. Pakistan. This table showed the better performance of the desalinization solar units if intake water adjustment was done @6 liters/hr/panel). Solar radiation eliminates a extensive sort of organic chemicals and pathogenic organisms by direct disclosure, is comparatively cheap and avoids legion of hurtful by-products of chemically determined techniques [12]. Supplementa-

ry outstandingly, the finances of the procedure are roughly capacity self-sufficient [13]. The decline in strength differs with wavelength; for wavelengths ranging from 200 to 400 nm, the diminution in concentration does not surpass 5%/m of water depth; though, it increases as elevated as 40%/m for longer wavelengths [11].

Just about 70% underground water is brackish. This water is unhealthy for drinking. The exclusion of surplus salts from saline water is the chief vital for the contributes of drinkable water at the inaccessible areas having dense saline water. Water quality is the main issues to safe the whole civilization from endemic diseases. Clean drinkable water is the vital true of the entire world. So, this experiment was installed at Goth Bashirullah, Gadani, Lasbela, Baluchistan. Pakistan. Electrical conductivity is the key criterion to assess the water vigor for drinking purpose. Data presented in table 2 showed the presentation of desalinization solar units installed. Brackish water having 4.27 dSm-1 salts at Goth Bashirullah, Gadani, Lasbela, Baluchistan. Pakistan removed the lethal salts through solar desalinization technique and reduced it to 0.21dSm-1. Water having so diminutive salts is fit for drinking purpose. Consumption of sunshine for the recuperation of brackish water through solar desalinization is the friendly environment, most economical and easily installed with local training. Maintenance cost of these solar units is also very small. The use of solar irradiation for management of chemically and biologically contaminated water is not an innovative drift [12,14,15-20]. Clean water is the indispensable obligatory for all living organisms. Now days, the availability of clean water resource is a major concern for mankind. A lack of infrastructure for water storage and distribution is also an issue in the developing world. More than 71% of the earth surface is covered with the water, but only 1% clean drinkable water is available with the international standards (Dev Rahul and Tiwari, 2009).

Latitude = 25° 18'N to 26° 14'N, Longitude= 66° 06'E to 66° 40'E								
Month	**Temp.(C°)**		**Ave. Discharge (lh^{-1})**			**Solar Panels**	**Solar Irradiation (KWh/m^2)**	**Volume of treated water day^{-1}(8hrs)**
January	**Max**	**Min.**	**Untreated**	**Treated**	**Drained**	**Nos**	**Umerkot**	**Liters**
Goth Bashirullah, Gadani, Lasbela, Baluchistan	27.8	20.2	86(24)	6	80	4	225	48
			82(24)	5	77	4	225	40
			74(24)	6	68	4	225	48
			70(24)	6	64	4	225	48

Table1: Performance Evaluation of 4 Desalinization units at Goth Bashirullah, Gadani, Lasbela, Baluchistan. Pakistan. The discharge of intake water (untreated) should be adjusted @6 liters/hr/panel.

Brackish water with source	Untreated Water			Treated Water			Drained Water		
	ECw (dSm^{-1})	**TSS(ppm)**	**pH**	**ECw(dSm^{-1})**	**TSS(ppm)**	**pH**	**EC w (dSm^{-1})**	**TSS (ppm)**	**pH**
GothBashirullah, GadaniHub, LasbelaBaluchistan	4.27	2753	8.7	0.21	134	8.0	6.10	3904	8.8

Table 2: Drinking water Quality Evaluation of Desalinization units at Goth Bashirullah, Gadani Lasbela, Baluchistan. Pakistan (Latitude = 25° 18'N to 26° 14'N, Longitude= 66° 06'E to 66° 40'E)

Conclusion

The desalinization solar units attained better results if intake water adjustment was done @6 liters/hr/panel). The brackish water with 4.27 dSm-1 salts through solar desalinization technique reduced the toxic salts to 0.21dSm-1 at Goth Bashirullah, Gadani, Lasbela, Baluchistan. Water having so little salts is vigorous for drinking purpose. This system creates consciousness among the local communities for the better use of salin water using solar desalination technique.

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