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# SOLAR ENERGY DEVICES: ANALYSIS AND SCIENTIFIC AND PRACTICAL SIGNIFICANCE

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Abstract: This in the article sun from energy to use based water desalination technologies main types, their constructive structure, performance principle and practical application sectors analysis made. Including, hot box, greenhouse type, many step by step and membrane sunny desalinator devices compared, their advantage and disadvantages illuminating Also, this devices water shortage there is regions, especially Uzbekistan arid in the regions stable water supply system in creation opportunities seeing is released. In the article technological approach, energy efficiency and ecological security criteria based on Suggestions have also been made.

**Key words:** sun energy, desalination, greenhouse type device, hot chest, water evaporation, condensation, ecological technologies, water shortage, alternative energy, energy efficiency, reflector, thermal isolation, local technologies, drink water supply

#### Introduction

Last globally in years to the surface coming climate changes, earth under of the waters decline, industry and village farm activity because of to the surface arrived ecological problems, clean drink water shortage further International on a scale statistic to the information because, on our planet billions people clean to the water enough has not. Especially in Africa, Asia and Near East in the regions desert and half desert regions this from the problem the most many suffering is smoking. This view from the point of view natural, as it were and alternative energy from sources use through water supply system stabilization necessity increasing is going on.

This respect sun energy the most promising source as separately importance profession The sun energy all for available, ecological clean, permanent accordingly updated standing and use for no how fuel unspendable natural is a resource. Exactly this features because of the sun from energy to use based technologies modern important of science from directions to one became.

Sun energy based on working devices inside desalination systems separately place These devices sun from radiation using, sea, salt or polluted water steaming and condensation to do through to drink suitable clean water harvest does. Simple work principle, relative cheap from materials preparation and ecological safety them world throughout, especially water scarce was in the regions wide current to be completed reason is happening.

Also, such devices energy independence provide, long term service to do and minimal technical service to demand to be shown also separated from These aspects, they population less located or centralized from infrastructure far away was regions the ideal solution for turns.

This in the article sunny desalinator of devices types, their constructive features, performance principle, practical application sectors and their efficiency increase according to scientific and technician offers in detail analysis is done. Through this this technology Uzbekistan conditions, especially water shortage there is was in the regions current to grow prospects seeing is



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released.

## 1. Main Types of Solar Desalination Devices

Solar desalination devices convert solar radiation into thermal energy to evaporate water and then condense it to produce clean, potable water. These devices are environmentally friendly and energy-efficient, making them especially useful in areas with limited water resources. The main types of solar desalination technologies include the following:

• "Solar Box" Type — This type is the simplest and most cost-effective option. The device mainly consists of a container painted black to maximize solar heat absorption. The container is covered with a transparent lid that helps retain heat inside and promotes evaporation. Its simplicity makes it highly suitable for small-scale or household use. Additionally, the low manufacturing and maintenance costs make this technology affordable and attractive for widespread adoption.

• Greenhouse Type Desalination Devices — These devices are more advanced and feature thermal insulation, reflectors, and optimized geometric shapes. The arched roof made from transparent polymer materials is designed to maximize sunlight absorption and heat retention. Inside the device, insulated containers help maintain high temperatures to facilitate efficient water evaporation, while reflectors focus and intensify solar radiation. This type offers higher productivity compared to the solar box and allows for faster and larger-scale clean water production. The optimal geometric design also plays a crucial role in improving device efficiency.

• Multi-Stage Evaporation Systems — These systems are more complex and incorporate advanced technology. They consist of multiple evaporation and condensation stages, each improving water quality by removing salts and other impurities step by step. These devices can produce large quantities of clean water but are more complicated and have higher initial costs, making them suitable mainly for industrial or large-scale water supply. Multi-stage systems also help conserve energy by utilizing the heat generated in earlier stages in subsequent steps.

Overall, solar desalination devices come in various designs and technological solutions tailored to meet different needs. Each type is selected and applied depending on specific conditions, scale, and economic feasibility. Therefore, detailed study and improvement of these device types and their technical characteristics open new opportunities for water resource management.

## 2. Devices constructive features

Greenhouse type sunny desalination devices his/ her own simple but effective construction with separated They are main part — polymer transparent coated arch It is a roof shaped like a sun. light maximum at the level acceptance to do and the heat storage for designed for. Polymer material high light permeability to the feature has is, this is with together solid and resistant to be because of of the device far term service to do provides.

Device inside salty water inserted heat isolated container located this is container of water slowly heating and far time the heat hold to stand provides. Heat insulation water high at temperature storage through evaporation process efficiency increases and this through clean water harvest to be provides. In the tag section located black film and sun the rays to absorb heat hold standing layer as service This layer of the device heat efficiency increase, water steaming maximum at the level encourages.

Also on the device siphons and reflectors there is they are water collect process order puts and sun light maximum at the level coating to the surface to direct help Reflectors using of



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light intensity is increased, this and of the device work efficiency further improves. Siphons and steamed water condensate as collecting in receiving important importance has clean water effective in a way separate takes.

Such devices 1 square per day meter field 3–5 liters for clean water working release to the possibility has. This indicator of the device efficiency and regional climate to the conditions related without change possible. Device geographical to the location looking at south is redirected because this direction sun from energy maximum use opportunity gives. Coating angle and of the area geographical to the width appropriate clear calculating For example, Bukhara in the city this corners 38° in winter, 38° in summer and 52° degrees organization it will, this and year during optimal operation of the device activity to provide service does.

Thus, the greenhouse type sunny desalination devices his/ her own simple and effective construction, high energy efficiency and to the region customized coating angle through water shortage the problem in solution big opportunities creates. Their use convenience and local to the conditions flexibility is also this technology wide to be used ground creates.

## 3. Scientific and practical results and application

Sunny desalinator devices various in the fields his/ her own high efficiency and reliability with separated In particular, they especially drink water supply heavy was in the regions important role plays. For example, the desert and half desert in the regions water resources limitedness because of this devices local population for permanent and good quality drink water source become service to do This is possible. health improvement, sanitation conditions increase and general life quality to improve help gives.

Also, such systems disaster in the zones, that is natural or man-made disasters as a result water supply disconnected in the regions emergency water source as application possible. Earthquakes, water floods or other disasters face gave in places, sunny desalinator devices independent work to the possibility has people for necessary was clean water in providing important assistant tool This is rescue and recovery their work in acceleration, and health safety in providing big importance profession will reach.

From this outside, at sea ships and in the deserts remote in the regions independent water source as such of devices application to oneself typical advantages gives. The sea on ships salty water desalination through drink water reserve create opportunity there is is, this at sea far time activity to conduct for necessary conditions provides. In the deserts and, electricity from networks disconnected or there is not been in the regions independent work feature because of population and industry needs in satisfaction effective will be.

Scientific research results this It seems sunny. Desalinator systems energy consumption noticeable at the level reduces, because they clean and again renewable sun from energy These devices use to the environment damage does not deliver, that is their performance during harmful waste or pollution to the surface it doesn't come, it and ecological stability in providing important factor is considered. From this except this devices far term during service to do capable they are regular technician service and small repair works with far years during effective performance continue will bring.

Brief as in other words, sunny desalinator devices not only technological and economic, maybe social and ecological even higher to value has to be, their local to the conditions customized without working release and in places It is also important to gather is an advantage. Local materials and from resources use and devices reduction, technical service to show simplification



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and local working to release develop opportunity This gives own in turn territorial to the economy positive impact shows and stable to develop service does.

#### 4. Disadvantages and suggestions.

Sunny desalination devices water in the supply important role Although they play, some disadvantages and restrictions available. The most important problem of devices sun to the energy directly related to be, that is only sunny in days effective work This is the weather. of the circumstances changeable, cloudy or rainy in days of devices work activity weakens or stop puts. From this outside, sunny desalinator systems at night work to the possibility has It is also important not to defect is considered, because evening and night hours water supply for important.

Also, the current modern devices big in size water working in the release limited big, big in quantity to the water was demand in satisfaction sometimes enough at the level efficiency show This is especially true for the population many and industry activity developed in the regions problem gives birth.

This problems eliminate to grow and sunny desalination technologies further improvement for one how much offers previously pushing possible. Including the sun energy on batteries save energy effective at night too to use opportunity giver modern energy storage systems current to grow These systems are important. through devices sun from energy day during if used, excessive energy on batteries full, dark and sunless continuous even in times performance is provided.

From this except for the heat far time hold standing insulation materials and thermal insulation from coatings use of devices energy efficiency to increase help Gives warmth. storage technologies because of water desalination process one flat and effective it will be, this and of the system work the deadline extends.

Also, many step by step desalination systems working exit The offer is also very This technology is relevant. through water one how many in stages step by step cleaning opportunity appearance to be, every one in stages of water quality increase and productivity multiplication possible In this way, the general of the system efficiency noticeable at the level will improve.

Above of offers done increase not only sunny desalination of devices efficiency increases, maybe them wider in the regions application opportunity This is the same as the in turn, water shortage the problem solution in doing new opportunities opens and ecological stability to provide big contribution Addictive.

#### Conclusion

Sunny desalinator devices today's on the day water shortage the problem solution in doing not only ecological, maybe economic also important and effective solution as manifestation This is happening. devices to the environment damage without reaching, the sun from energy using salt or salty water drink and village farm for suitable to the situation to bring opportunity gives. Scientific approaches based on working optimal design and technologies geographical to the conditions adaptation through of devices efficiency noticeable at the level increase possible. With this together, they water resources saving and again renewable energy from sources use through ecological to stability contribution added.

Uzbekistan desert and half desert in areas, especially such technologies wide in scope current to grow state of the policy priority from directions one to be It is necessary. It is not only water shortage to reduce help gives, maybe village farm field development, population marriage



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level improve and regional economic to grow service does. From this outside, sunny desalinator systems expandability ecological balance preservation, salted from the lands productive use and natural resources to save opportunity creates. Therefore, in the future this technologies further improvement and effective application according to research works and practical projects expansion important importance profession will reach.

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