E6 - Water recovery contained in dew

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1) What is involved ?

The appearance of dew is caused by condensation of the water vapour contained in the air as soon as its relative humidity level reaches 100%. The phenomenon occurs at night on cold surfaces. The process calls for fitting out surfaces on the ground or on roofs so that the water that forms in this way can be recovered for use as a source of water for human nourishment.

2) Who uses or recommends this means and since when ?

For a very long time now, man has sought to recover this water that "falls from the heavens", but it is only since the 1990s that there have been attempts to perfect mechanisms for improving efficiency, and therefore producing and recovering a larger amount of water. The OPUR association was one of the first to perfect dew recovery systems. Their website (refer to subsection 8) provides full information and a bibliography covering this process. Systems have been installed in desert areas where fresh water is in shortest supply and where dew can offer an essential complement, even if production levels remain low.

Systems have also been installed in a number of regions in India, Croatia, Burkina Faso, Morocco, Israel and even France (Corsica).

3) Why ?

Many hot countries suffer from a total lack of water. Yet,**the level of humidity in the air, in the atmosphere is sometimes considerable** in these locations. In these desert regions, the only way to get a little water is to recover this water vapour through dew collection. The yields involved are relatively low ones, but as this water vapour is present everywhere, **it is at least in theory possible to access this resource throughout most of the world.**

4) Who is primarily concerned ?

Populations living in desert areas where rainfall is low or nonexistent.

5) What does this process involve ? how is it used ?

The principle is a simple one. Dew results from the transformation of water vapour in the air into liquid water droplets. The phenomenon occurs at night on cold surfaces when the relative humidity level in the air exceeds 100%. This is referred to as air reaching its "dew point".

This cooling is a natural phenomenon that occurs without any need for energy. The potential for condensation depends on the location’s climatic and meteorological conditions. Yields are therefore highly variable. They depend on air conditions, on the material used for the condenser and on its layout so as to recover the most water. Condensers are inclined elements covered with a special film that collect the dew and channel it towards a storage tank. Ditches covered with a heat insulator can also be dug, or a house roof can be used, if it is a sloping one.

To trigger condensation, all that is needed is to cool a surface by just a few degrees. We have therefore sought to produce coatings that cool naturally. The solution comes from applying "radiating" cooling, i.e. the natural cooling of any object when it emits infrared radiation.

Using coatings with high infrared emissions that can be incorporated into plastic (polyethylene) films, and more recently into paints, has allowed improved yields. These coatings contain microballs of titanium oxide or barium sulphate, as well as an insoluble food-safe soap so that the drops slide easily along the surface. By covering the ground in this way, the condenser temperature is lowered by 4 to 10°C. The dew point will then be reached as soon as the sun goes down and the condensation yield is significantly increased, to up to 0.7 litre per square metre per night. On average, yields are however lower and often more like 0.1 to 0.2 litres per square metre of roof or ground area.

6) Main advantages and drawbacks

Advantages : Cost of operation is practically zero. Maintenance does not require any special skills.

Drawbacks : Production remains modest and variable, depending on weather conditions.

N.B. This process using radiating sheets has not been in service long enough to have collected significant feedback from the field.

7) Cost

In Europe, the cost of radiating sheets is round 2 Euros per square metre. Paint is a little more expensive, but far easier to use. In India, thanks to low labour costs, sheets cost only 0.4 Euros per square metre.

8) Where to obtain further information ?

a) Website

- OPUR : This association’s website provides complete information on its actions and on the experience gained by its founder Daniel Baysens, who perfected dew condensers with special coatings. There is also a bibliography. http://www.opur.fr/fr/index_fr.htm

- **WELL**, portal of the Centre for Water Resources, Sanitation and Environment of the University of

Loughborough, Leicestershire (UK) where there is also among the "publications" in the "Water supply" section then "domestic rainwater harvesting" an interesting sheet on the subject : http://www.lboro.ac.uk/research/wedc/well/water-supply/ws-factsheets/domestic-rainwater-harvsting/
- **IRHA, portal of the International Rainwater Harvesting Alliance (Geneva)** : http://www.irha-h2o.org/ ; (English version, technologies section)

b) Vidéos

- An 8’ DailyMotion and OPUR video with French subtitles, "Collecte d’eau de rosée pour produire de l’eau potable" (Collecting dew to produce drinking water) showing how to make various dew condensers covering 300 to 1000 sq. metres in Southern India (Gujarat and Tamil Nadu). Available online from : http://www.dailymotion.com/video/x8...
- Another 11’ video by the OPUR association called "Récupération de la rosée" (Collecting dew), in French with English subtitles, explains in detail the history of the process and how to apply it. Available online from : http://www.dailymotion.com/video/x5...