Mechanical solar salt harvesting worldwide

Vladimir M. Sedivy MSc (Hons) Chem Eng, IMD President Salt Partners Ltd, Zurich, Switzerland

Watch the video record of this presentation. <u>www.youtube.com/watch?v=gF0Dz-TfuZ8</u> (16':32") Download "Sunny times for solar salt": <u>www.salt-partners.com/pdf/Sunny%20times%20for%20solar%20salt.pdf</u>

Basic types of salt harvesting methods

- Manual harvest by hand and manual transport
- Manual harvest with tools and manual transport
- Manual harvest with tools and mechanised transport
- Mechanised harvesting and mechanised transport



Mexico Portugal Bulgaria Greece Namibia India China Australia

SALT PARTNERS

EuSalt Annual General Meeting, Sevilla, 23.-25. May 2012

Salt Partners Locations

Salt Partners Salt harvesting in Ghana



In Ghana, the most simple salt harvesting method – by bare hand –

is still being

practised today.

Watch the video: www.youtube.com/watch?v=vxb2-Wh0FYg&feature=plcp (1':26")

Salt Partners Salt harvesting in Portugal

SALEXPOR



In Portugal, salt is still harvested using an ancient method brought in by the Arabs in the Middle Ages.

However, also semimechanised and fully mechanised harvesting techniques are employed in modern saltworks.

Watch the video: <u>www.youtube.com/watch?v=KOJKU6sUZU0</u> (0':52")

Manual harvest and mechanised transport



In Bulgaria, the transport of the harvested salt has been mechanised but the salt is still being harvested by hand.

SALT PARTNERS

Two belt conveyors bring the salt to a slurrying vessel mounted on a tractor.

Watch the video: <u>www.youtube.com/watch?v=e95ZGsoCWJ0</u> (2':50")

Salt Partners Hydraulic transport of salt slurry



Hydraulic transport lines.

One pipe carries the slurry, the other line brings the transport brine back to the slurrying vessel on the tractor.

Men push the lines mounted on wide wheels.

SALT PARTNERS

Salt Partners Salt washing plant on rails



Salt slurry is discharged to a salt washing cone.

The overflowing transport brine is pumped back to the harvesting unit.

SALT PARTNERS

Basic types of mechanical salt harvesters

- Tractor driven or self propelled
- On wheels or on Caterpillar tracks
- Driving on salt bed or on crystalliser floor
- Cutting salt bed upwards or downwards
- Discharging onto belt conveyors or into trailers

Harvesting system in Yucatan, Mexico



Tractor pulled harvester on double wheels drives with one side on the salt and with the other side on the crystalliser bottom. The harvester lifts the salt to a double wheeled trailer pulled by a truck driving on the salt bed.

SALT PARTNERS



Harvesting system in Yucatan, Mexico



The salt layer is first ripped (scarified) and then windrowed.

Salt floor is maintained on the crystalliser bottom.

The higher cost of multiple operations is optimised against the lower cost of equipment.

SALT PARTNERS

Feeding system to the washplant in Yucatan



Salt is discharged from the trailers automatically, directly into the feeding hopper of the washing plant.

SALT PARTNERS

Harvesting system in Kalloni, Greece

SALT PARTNERS



Kalloni saltworks operate a harvesting machine on Caterpillar tracks.

The machine drives on the salt, cuts the salt bed on the side and lifts the salt to belt conveyors.

Watch the video: www.youtube.com/watch?v=qDQtSABdzZE (3':34")

Salt Partners Kalloni salt harvesting system



The Kalloni harvesting operation is controlled by a man walking alongside the harvester. He adjusts the position of the cutting edge by a hand held controller.

Observe the salt layer being lifted from the mud floor by the cutting edge.

Salt is cut downwards, thrown upwards and lifted by a rubber belt to the belt conveyors.

Salt Partners Kalloni salt transport system



Belt conveyors bring the salt to a mobile bin driving on a causeway.

Dumpers transport the salt to the washing plant.

SALT PARTNERS

Messolongi harvesting system

At Messolongi in Greece, the harvester drives on the crystalliser mud bed.

SALT PARTNER

The harvester cuts the salt in front of the machine and lifts the salt to a system of engine driven belt conveyors.

Watch the video: www.youtube.com/watch?v=l4_tvHLYtYA (4':51")

Salt Partners Messolongi harvesting system



The cutting level is controlled mechanically by a plate sliding on the salt layer surface.

The salt is broken upwards and lifted to a belt conveyor.

Walvis Bay (Namibia) harvesting system



Walvis Bay salt harvesting system was supplied by ROV Durrant Pvt Ltd, Port Elizabeth, South Africa.

The harvester moves on Caterpillar tracks, both on the salt bed and on the crystalliser floor. Salt is loaded directly to the trailers.

Watch the video: <u>www.youtube.com/watch?v=pZ-zwCR2B8k</u> (2':36")





Salt is cut by a rotating drum upwards and discharged to a chain elevator located behind the drum.

Cutting elevation is controlled by a laser.

SALT PARTNERS

Salt transport at Walvis Bay



Wide wheel trucks with two trailers bring the salt from the harvester to the washing plant.

Salt is discharged from the trailers automatically through the bottom opening.

SALT PARTNERS

Not all salt harvesters are successful



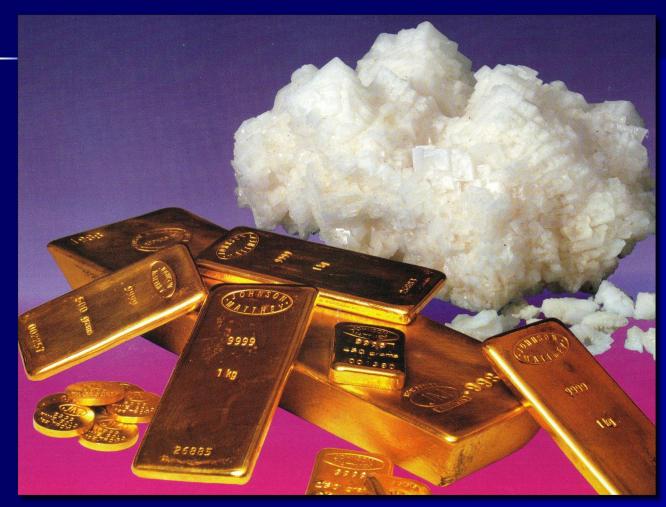
Example of a wrongly designed salt harvester that landed on the scrapyard.

SALT PARTNERS

Conclusions

- There are many salt harvesting systems
- Which system is the best for you, depends on many factors
- Salt Partners experience is at your disposal





Why not turn your salt into gold?

```
SALT PARTNERS
```