



## Salt bath plants for the curing of rubber profiles

Effluent-free and environment-friendly  
**Cooling plants for the UHF Technology**



Technical Information

# LCM - Salt bath plants for the curing of rubber profiles

## Newly developed, environment-friendly salt bath curing technique from Durferrit GmbH

In recent years, ecological requirements have brought about developments which have opened completely new perspectives, also for the DURFERRIT salt bath technology with more than 80 years of experience.

In addition to the introduction of environment-friendly salts for ther-

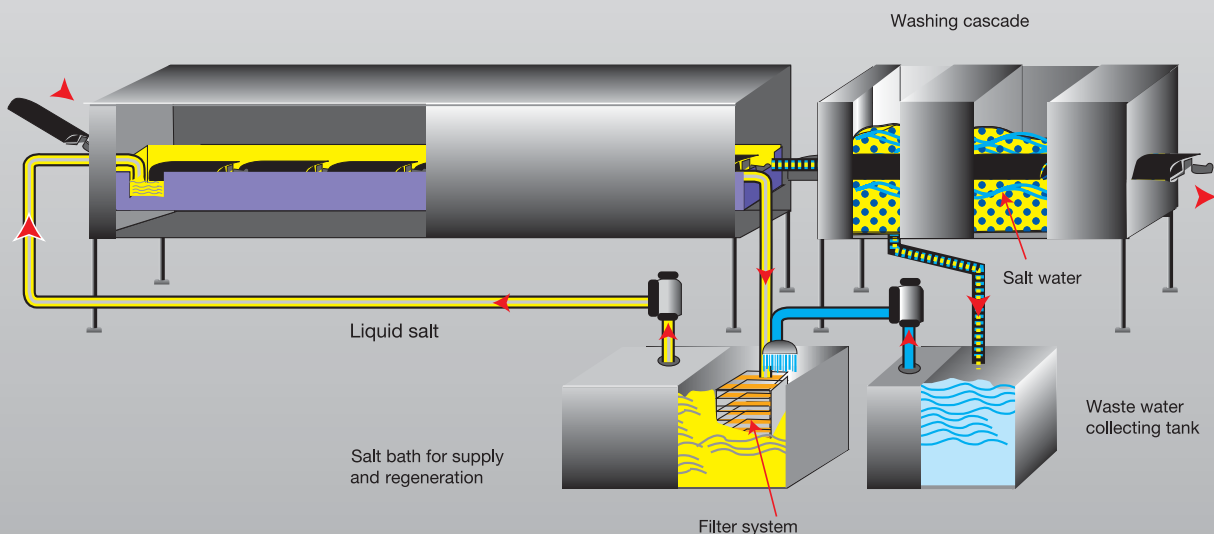
mo chemical heat treatment processes, the periphery of salt bath plant techniques has also experienced some change.

New salt bath plants operate without effluents occurring. This means that the treated parts are rinsed thoroughly, using a minimum of fresh water, in a cascade washing system, and that the relatively small amount of rinsing water can be processed very economically. The recycled salts can be used again. Should a recycling not be possible, the salts concerned must be disposed of in

accordance with the local regulations. Durferrit GmbH will, of course, be glad to help customers find suitable solutions to their problems.

In order to meet today's ecological requirements, we have developed a new salt bath technology for curing, which is described in this brochure.

## Salt Bath Curing Plant



In a separate electrically-heated or gas-fired salt bath furnace, the salt melt is warmed up to curing temperature, which is between 200°C and 280°C. By means of an electromotive salt bath pump especially developed for this purpose, the salt is pumped into the curing bath through a pipeline or also by a sprinkler unit.

At the end of the curing salt bath pot, the molten salt runs back into the supply salt bath via an outlet. In this central supply salt bath there is a desludging area with a strainer screen through which the salt flows back into the pot. At the same time, floating particles,

sludge and carbonates are separated from the curing salt bath, and can be removed easily.

The curing salt carried out with the rubber profiles is concentrated in the rinsing cascade, solid particles are filtered out, and the reaction foam is (for example stearites) automatically removed.

By means of an automatically controlled pump, the concentrated salt solution is pumped out of the waste water collecting tank and sprayed onto the surface of the separate supply and regeneration salt bath.

The rinsing water evaporates, and the reclaimed salt is again in the supply cycle.

Described below are the advantages of the system compared with conventional curing salt baths:

- The continuous filtering and cleaning of the curing salt bath ensures high quality results.
- Almost all the salt dragged out of the bath is regained and reused.



- Feeding the curing plant with molten salt ensures a uniform temperature. Fluctuations in temperature due to filling of the curing salt bath with solid fresh salt do not occur.
- Due to the continuous inlet and outlet of molten salt, the level of the curing salt bath remains constant, so that the pressure on the rubber profiles is always the same.
- The supply and regeneration salt bath can be gas-fired, and is therefore particularly economical to operate.

- Continuous desludging ensures there is no fire-risk due to rubber particles floating in the curing plant.

### Plant design

The classic curing plant is made up of single units, in which profile running speeds of 100 m per minute are possible. Several profiles can run through the plant at the same time.

The following plant design can be regarded as standard:

- Profile inlet band between extruder and salt bath, with infinitely variable drive.

- Spraying system for precuring the profiles, ensuring a pressureless coating of molten salt around the profiles over a wide area. Blocking up of the spraying system does not occur due to the continuous filtering of the molten salt. The spraying units are provided with an electric motor which enables them to be moved vertically, so that new profiles can be easily inserted.
- In 2 or 3 further units, powered rollers or steel bands guide the rubber profiles under the surface of the salt bath. These units can also be moved vertically to enable new profiles to be inserted.



- Behind the unit is the centre-piece of the plant, in other words the regeneration salt bath for the filtering, the reclaiming of the carried out salt, and the transfer of the molten salt. The rubber profiles run over this salt bath in a closed tunnel. By means of a special nozzle system, most of the adhering salt is blown from the surface of the profiles into the salt bath below.
- Subsequently, the profiles are run through a 3 or 4 tank cleaning and cooling cascade and leave the plant absolutely salt free, dry and at the required temperature. They can then be guided on to a winding device or a caterpillar drawing device.

- Usually the salt baths are between 12 and 30 metres long, depending on the parameters requested by the customer. A further 8 – 10 metres are required for the cascade.
- Modern control systems with connections to the extruder, and documentation are in accordance with the DIN ISO 9000 ff and can be integrated within the plant.

### Cleaning cascade

Economical use of this newly developed vulcanizing technique requires a high salt concentration in the rinsing water. To deal with

this, a cascade technology has been developed, which is described below:

The cleaning cascade consists of three or four lower tanks which are designed as a washing cascade. The rinsing water within the cascade flows in the opposite direction to that in which the rubber profile to be cleaned is being transported.

The upper sections are located on top of the washing cascades. The doors of these upper sections can be opened pneumatically or manually so that when the plant is closed, the running profile is cleaned by high pressure spraying in the tunnel.



The independent cascade areas are separated by means of a compressed air curtain in such a way that the adhering salt-bearing rinsing water is pushed back into the previous cascade unit. The drying process is a special function of the last air curtain.

This cleaning line is completed by a storage and filter tank as well as a control cabinet. The entire cleaning cascade is made of stainless steel.

The cleaning cascade fulfils the following tasks:

- The profile is washed thoroughly so that almost 100 % of the

adhering heat transfer salt is removed and can be regained.

- Water requirements are cut down to a minimum compared with other cleaning procedures.
- The profiles are cooled so that they are warm to the touch, even though the amount of water used in cooling has been greatly reduced.
- A concentrated salt solution is obtained in the first cascade so that the evaporation which follows in the separate Durferrit supply salt bath can be done economically and without harmful substances.

- In each individual cascade the rinsing water is filtered so that when the salt is later reused no microparticles are brought into the curing bath.

### Supervisorsystem

By means of PLC all motion sequences, temperature and security relevant data will be registered and can be recalled at the operation screen. Sufficient memory capacity enables the documentation of the treatment process in various programs. It is possible to integrate the extruder as well as the extractor and coiling installation into the system.



## The Environment

### Waste air

A small waste air cleaning plant consisting of a fume scrubber used with a cyclone cleans the salt-bearing waste air, which contains salt and organic residues, coming from the curing plant.

At high performance an oil separator system will be connected in series before the wet scrubber.

At regular intervals, the waste water which occurs in the fume scrubber is fed back to the curing cycle via the waste water collecting tank.

### Waste water

At intervals, the highly concentrated salt water from the washing cascade is fed into the regeneration salt bath from the waste water collecting tank. The salt returns in molten condition to the curing cycle, and the water vapour is discharged above the roof.

### Waste salt

Small amounts of carbonates and rubber particles accumulate in the filter basket of the reclaim furnace, which can be disposed of in accordance with the official regulations for the waste management of solid salt residues practised by Durferfrit GmbH.



# Modification of existing salt bath plants to the environment-friendly Durferrit concept

## Evaclean / Ecoclean system

- a compact environment-friendly combination of cleaning cascade and salt reclaim furnace
- can be integrated into an existing salt bath curing plant
- continuously cleans and cools rubber profiles during treatment in an excellent way
- returns the carried out salt to the curing cycle

The technological development of the process, to meet market requirements, has led to the compact and space-saving design of the Evaclean/Ecocleansystem.

These plants are in popular use for the environment-friendly operation of existing salt bath curing plants.





## Special plants

The picture opposite shows a 75 m long salt bath which has been built for the continuous curing of hoses up to a diameter of 50 mm.

Two hoses of different dimensions and running speeds can pass through the curing plant parallel to each other. During the process, the hoses swim on the surface and are covered with molten salt by a special spraying system.

The plant allows a maximum speed of 30 m/min. In the subsequent cooling area of approx. 20 m length, the hoses are cooled to room temperature.

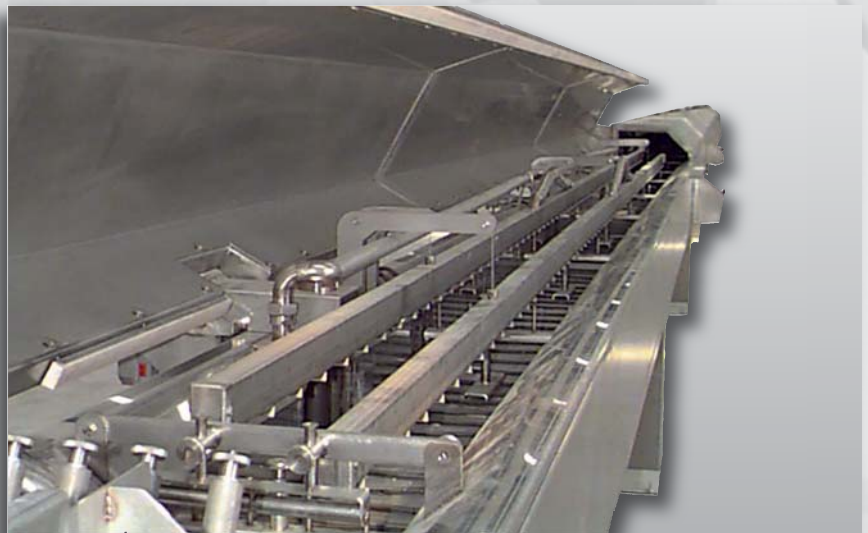
## Test plant for treating new profiles

The picture shows a mobile test plant for the optimisation of new profiles and rubber combinations. This plant, with a total length of approx. 5 m, consists of a salt bath and water rinse basin.

Inside the salt bath is a steel band system for speeds up to 20 m/min., which moves vertically.

At the end of the salt bath there is an infinitely variable drive to assist the movement of the profiles.

This test plant ensures that the existing production plants are not used for the introduction of new mixtures and profiles.



# Cooling plants for the UHF Technology

In the past, long water cooling units were necessary to cool rubber profiles cured in micro wave plants and air circulation furnaces down to room temperature.

Subsequent to the Vulcanoclean system developed for the cleaning and cooling of the profiles, we have developed a cooling system which gives the required cooling performance in extremely short units.

Based on a total plant length of 2 m, a reduction of 25 kW thermal energy/hour can be obtained. Combining several cooling blocks permits individual matching of the rubber profiles to the running speed in relation to the cross-section.

## Cooling of flocked profiles

A special modification of the cooling technology previously described permits cooling and thorough drying of flocked profiles.



## Air cooling plants

A highly effective air cooling unit has been designed for rubber profiles whose running speeds and cross-sections permit a relatively mild cooling.

In the cooling channel of the plant there is a fibre-glass band, whose speed is infinitely controllable and which can be adjusted to the running speed of the profile.

The pneumatically operated lid permits easy insertion of the profiles.

After closing the lid, the high performance cooling blower starts automatically, and an all-round intensive cooling takes place.

The compact unit of ergonomic design is supplied ready for installation and can be integrated into an existing UHF plant without difficulty.

## Technical data of the standard design:

Total length:	9.300 mm
Width:	600 mm
Height of profile inlet:	1.120 mm
Cross-section of profile inlet:	70 x 40 mm





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