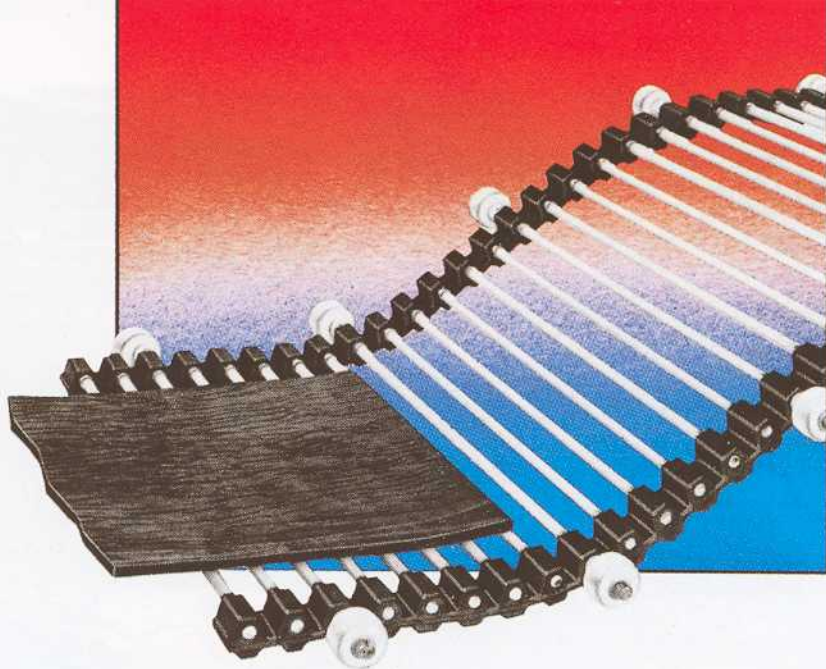


**Cooling lines with
bar grid conveyors
for unvulcanized rubber**

Immersion Cooling
Spray Cooling
Air Cooling



NERAK
FÖRDERTECHNIK





Cooling lines with bar grid conveyors for unvulcanized rubber

When processing unvulcanized rubber, the quality of the starting material and the intended use of the finished rubber product are of decisive importance for the mixing ratio, the mixing process and the shaping of the material into strips, sheets or slabs. Prior to their intermediate storage, the shaped profiles or sheets are cooled down from a processing temperature of 90 - 120 °C to approx. 35 - 40 °C. NERAK cooling lines for unvulcanized rubber ensure an even cooling of the product. Any partial vulcanization due to residual heat or any sticking of the product despite the application of a separating agent can thus be avoided.

The special technical concept of NERAK cooling lines for unvulcanized rubber eliminates any risk of damage to the soft and sensitive profiles during the cooling process. Moreover, there are different types of cooling processes for slabs coming from a mill, sheets produced by calendaring and extruded profile strips.

With NERAK cooling lines for unvulcanized rubber, the product is placed flat on bar grid conveyors and led through the cooling agent (water, air) or through the separating agent.

The bar grid conveyors are composed of NERAK rubber chains with steel wire inserts and polyester bars with glass fibre reinforcement which are integrated into the chains.

The open grid resulting from this design allows the product to be evenly surrounded by the cooling agent from all sides.

The cooling agent preferably used is water. As the unvulcanized rubber is covered with water from all sides, the heat can be removed evenly and rapidly, which is a prerequisite for a compact design of the cooling line.

NERAK cooling lines for unvulcanized rubber can be perfectly adapted to varying local conditions.

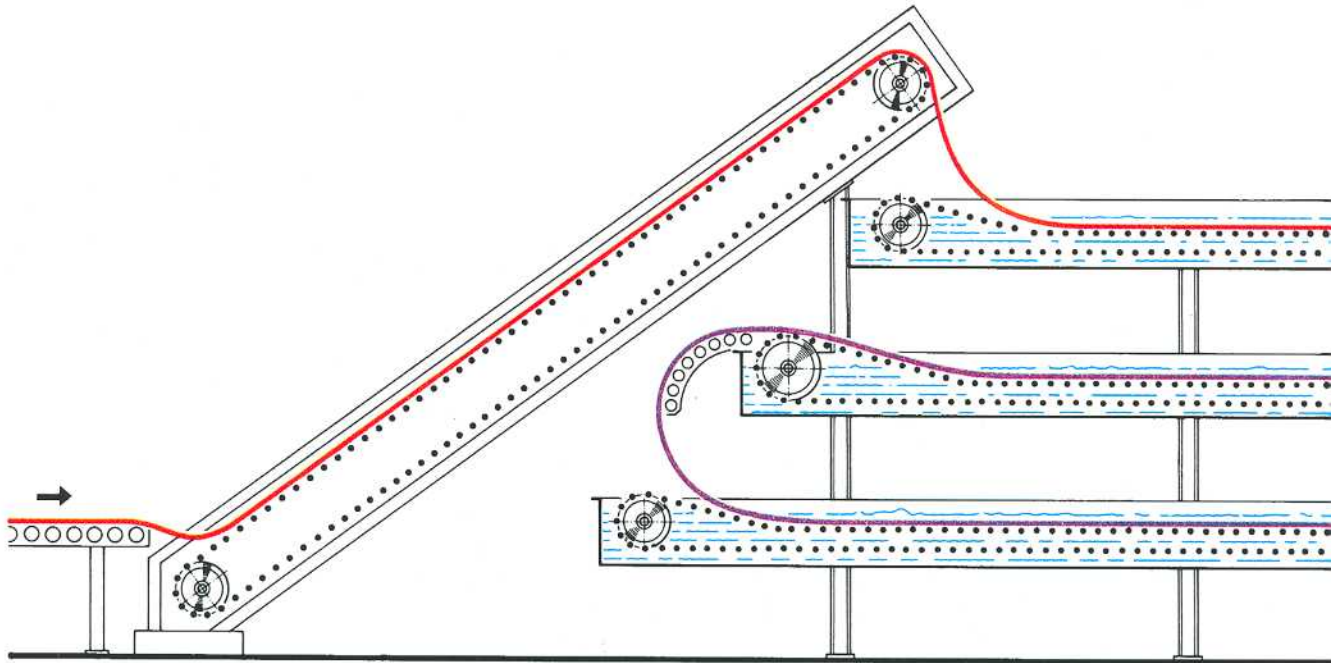
By integrating NERAK bar grid conveyors, older-type cooling lines with different systems can easily be modernized. The cooling capacity and profile accuracy can thus be decisively improved.



NERAK bar grid conveyor with plastic links for a larger supporting surface

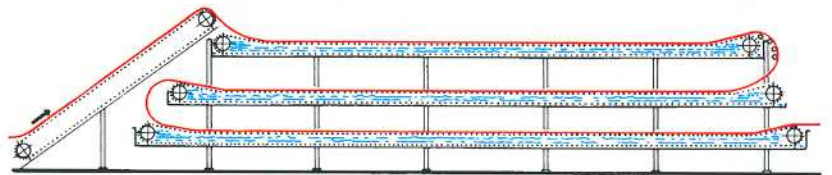


NERAK bar chain conveyor of standard design

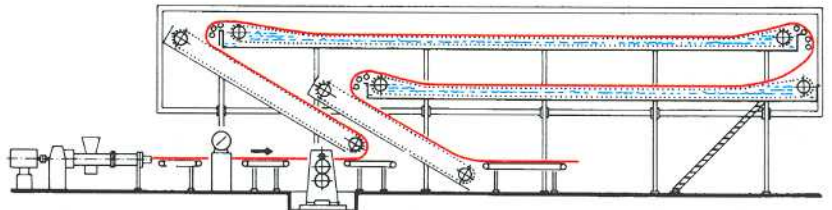


Examples of design and application:

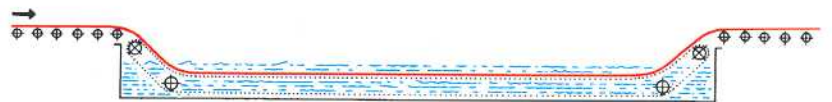
After having been shaped on the extruder, the unvulcanized rubber tread is led via a checking and marking unit to the cooling line. This constructional unit is floor-mounted.



When the cooling line is arranged on supports, the surface area it occupies in the production hall is limited. Moreover, all units that are arranged further upstream or downstream from the cooling line are positioned very close to each other, which ensures a very easy and efficient operation.



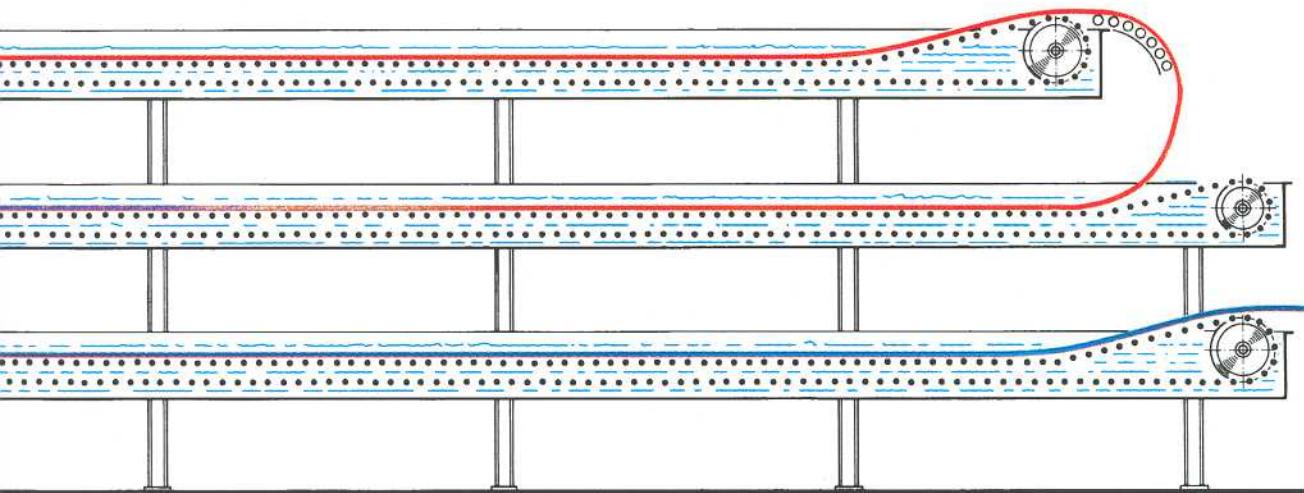
Cooling lines for the production of thin profiles and sheets take over the product right behind the roll mill. Due to their immediate immersion into the water bath, the risk of the products getting damaged is virtually eliminated.



With batch-off lines, which are equipped with an immersion tank or a spraying unit upstream from the cooling tunnel, the NERAK bar grid conveyors serve to convey the unvulcanized rubber articles.

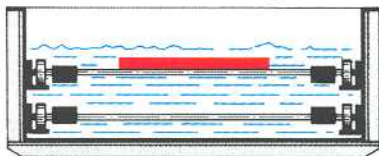
Several rubber block chains are arranged in parallel and connected by means of polyester bars, thus forming an open grid. The individual rubber block chains ensure that the slab is kept on the steeply ascending belt.

Owing to the open grid, the product is evenly wetted with the separating agent. As the belt is free from joints, it can be universally applied.



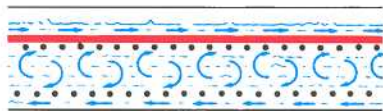
The cooling agent can be supplied as follows:

Immersion cooling



As cooling by immersion in water is a very cost-effective solution, this is the most frequently chosen process. This type of cooling is highly efficient. Moreover, the lifting force of the water allows the strips or sheets to be treated very gently, without causing them to float on the water surface. A further advantage consists in the easy accessibility of the troughs which are open towards the top. The product can thus be checked at any position. Energy, maintenance and service costs are relatively low as compared to other constructions.

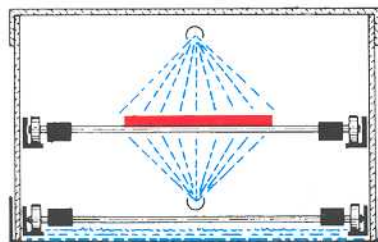
This is also due to the fact that the water consumption is kept low, as the bars of the carrying and return run of the bar grid conveyor cause an intensive whirling of the water inside the trough.



If multi-level cooling lines are used, the cool fresh water is filled into the last trough and led via overflows or submerged pumps into the upstream troughs according to the counterflow principle, thus reaching the product to be cooled. The water is supplied either manually by actuating a shut-off slide or fully automatically by means of

diaphragm valves, with the temperature being controlled throughout the process. The heated water is conveyed to the plant's water conditioning system or used for power generation by means of heat pumps.

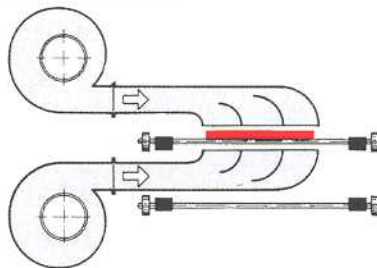
Spray cooling



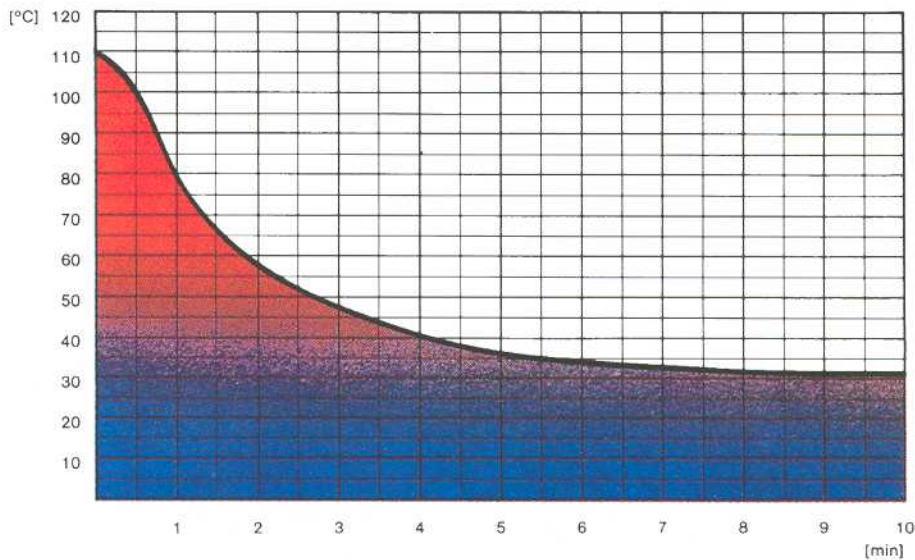
Owing to the open design of NERAK bar grid conveyors, the product to be cooled is evenly and intensively sprayed from both sides, even on the supporting side. This is an essential prerequisite for a stress-free cooling process. The nozzles are designed in such a way that the heat shell is broken through by the water drops directly at the product. Moreover, the product is further cooled due to the evaporation in the spraying tunnel. The cooling effect thus obtained is even more intensive than with the immersion cooling process. For this reason, the length of spray cooling lines can be reduced by approx. 10 -15 % as compared to immersion cooling systems. This is a decisive advantage if the available space is limited. The spraying water is supplied from the collecting tank to the spraying nozzles by centrifugal pumps. It may be necessary to use a band filter for the return flow as well as for the fresh water in order to avoid a clogging of the spraying nozzles with foreign matter. The optimum water supply is generally determined by the conditions on site. Provided that the spraying tunnel is efficiently

sealed, a water pressure of 1.5 to 2 bar can be applied at the spraying nozzles. This is the most favourable condition for an intensive cooling. If, however, the spraying points are not covered from the top or the unvulcanized rubber is sprayed from the top only, with its bottom side being conveyed through the water trough, the maximum admissible pressure is 0.2 to 0.3 bar. If it were any higher, the spray would heavily affect the environment. Mention has to be made of the fact that the cooling intensity is lower than with closed systems.

Air cooling



Air cooling is rarely applied for high-performance lines with bar grid conveyors, as this system would entail an increased constructional length. If anything, air cooling units are used downstream from immersion or spray cooling systems as compensating sections or for recooling and drying. Cooling by separating agents is preferably applied for cooling unvulcanized rubber slabs with a blower cooling unit that is generally arranged further downstream.



Determination of the cooling section length

The length of a cooling line is dependent on the necessary residence time of the unvulcanized rubber in the cooling section and can be determined by special calculation programs.

Drive

Bar grid conveyors are generally driven by variable speed drives. When processing continuously extruded strips, the belt speed has to be scanned at the free loop at the beginning of the belt. The scanning roll transmits a switching signal to an electric control unit which increases or reduces the belt speed as required. Scanning rolls (rocker arms) are arranged at the beginning of each belt. The strip can also be scanned by contactless switches at the beginning of the belt. In any case, the strip is treated very gently and not subjected to any elongation or compression.

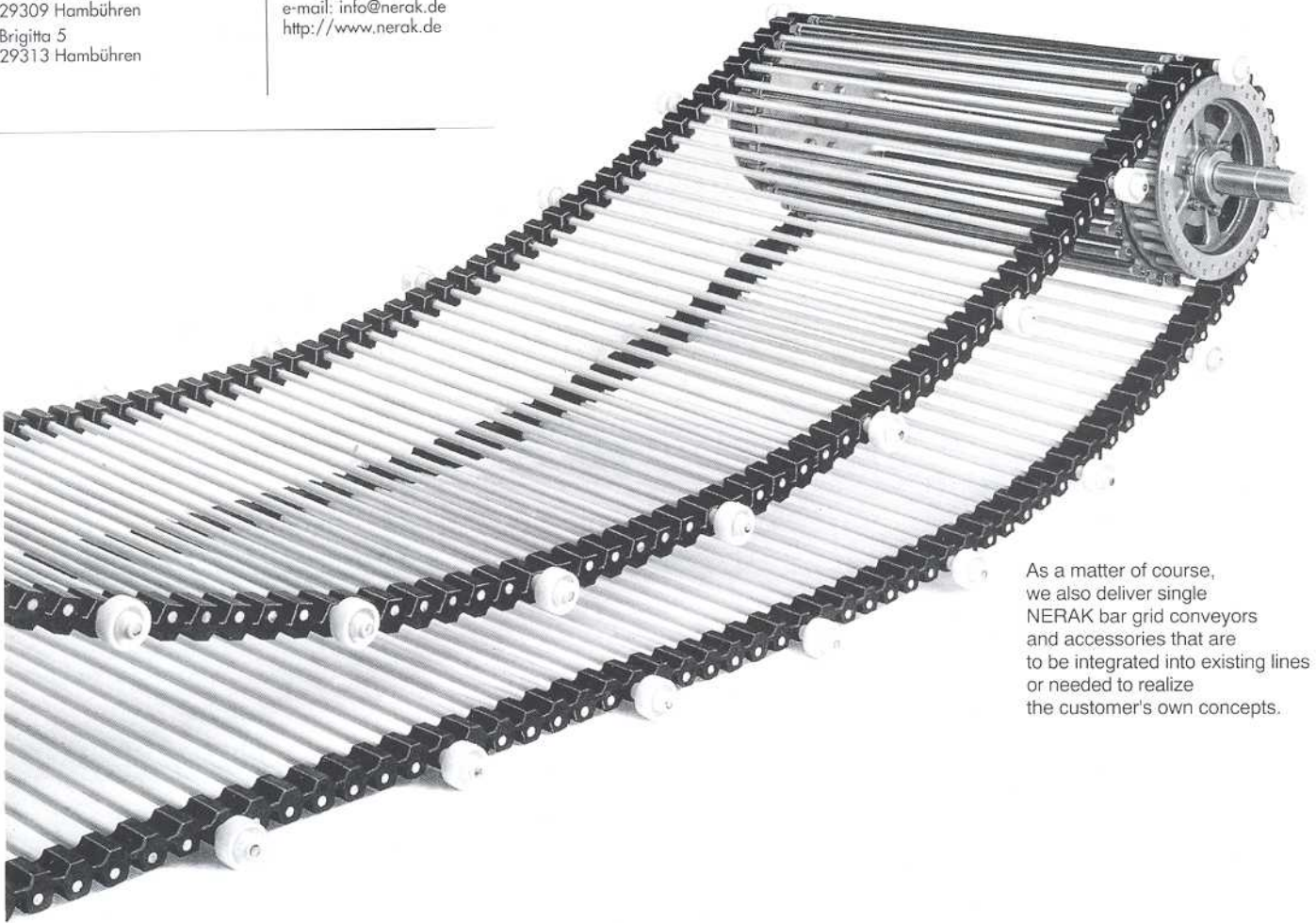
This is an decisive advantage for tread cooling lines, as the strip length remains unchanged after cutting.

If slabs or sheets of finite length produced on a mill are to be cooled, the line is provided with a central drive. With an appropriate rating of the chain drive, a synchronous run or, if necessary, an advance of the following belt can be obtained.

Owing to their clear and modern design, NERAK cooling lines for unvulcanized rubber offer an optimum solution for an intensive cooling of the product, while at the same time ensuring low energy costs, a smooth run, low service and maintenance costs and a long service life. Please do not hesitate to contact us for detailed information or advice on the modification or modernization of existing lines.

NERAK GmbH Fördertechnik
Postfach 1154
29309 Hambühren
Brigitta 5
29313 Hambühren

Telefon 0 50 84/944-0
Telefax 0 50 84/944-222
e-mail: info@nerak.de
http://www.nerak.de



As a matter of course, we also deliver single NERAK bar grid conveyors and accessories that are to be integrated into existing lines or needed to realize the customer's own concepts.

NERAK bar grid conveyors

**Sturdy,
reliable and
proven in practice**

General description

The bar grid conveyor is free from joints and composed of two or more rubber block chains that are arranged in parallel and connected by polyester bars.

The top side of the bars supports the product to be cooled. The product surface is thus evenly surrounded by the cooling agent from all sides.

Combined with the toothed drive wheels, the rubber block chains allow a precise conveyor run and a controlled speed to be obtained. The length and width of the bar grid conveyors can be freely chosen.

The conveyor is generally supported by lateral plastic rollers or by supporting rollers or sliding bushings that are fixed to the housing. Short belts with several reversing points do not require any support.

Bar grid conveyors for cooling lines are preferably equipped with detachable hinges at the rubber block chains. Maintenance is facilitated by using bar grid conveyors that consist of individual conveyor sections with a length of approximately 10 m each.

The supporting surface can be enlarged by providing the bars with plastic links which bridge the gap between them.

For applications in materials-handling technology, the low-noise run even at high speeds, the perfect corrosion resistance and the long service life of the conveyors represent special advantages.

Special designs are also available upon request.