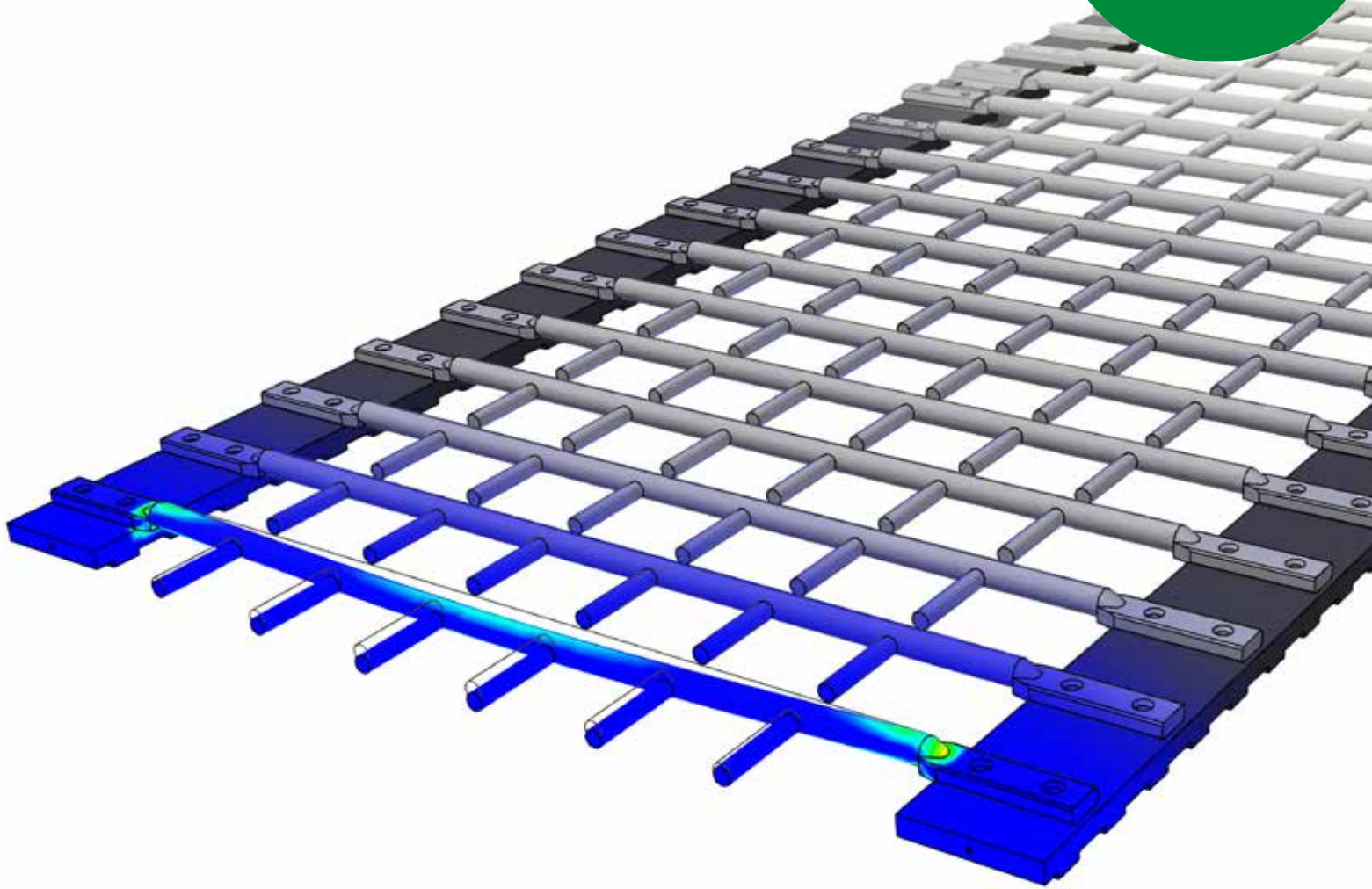


Hardened rods

For a longer life expectancy

Stronger and
more wear-
resistant



Steel rods deform or break by bending them. The stronger the material, the more stress it can endure. In order to load rods more heavily, material having a higher yield and tensile strength should be chosen. Broekema's heat-treated rods are produced from a non-treated raw material and get a heattreatment giving them a higher constant hardness over the entire length of the rod.

Hardened rods

Material strength

Steel rods deform or break by bending them. The yield strength of steel determines how far a rod can be bent without permanent deformation. The yield point is expressed in terms of the required force (Newton) required per mm² surface area to permanently deform the rod. This is the point where the rod passes through the elastic limit and will not return to its original state.

In addition to the yield point, **tensile strength** is also of interest. The tensile strength determines the point when a rod actually breaks. In order to determine the quality of the rod, we look at both the **yield strength** and the **tensile strength**, combined with the **percentage reduction** of the diameter. The percentage reduction of the diameter indicates how "tough" the material is. The higher the percentage, the more the steel is elongated, which indicates a tougher material.

The stronger the material, the more stress it can endure. In order to load rods more heavily, material having a

higher yield and tensile strength should be chosen. To attach rods to traction belting the rods must be forged. Forging is done by heating the rod and flattening the ends. However, during this forging process the heating of the steel changes the mechanical properties of the steel. In crucial areas the rod is weakened, strength is compromised, and broken rods become a risk. For conveyors with more than two traction belts the risk is multiplied, as the middle sections often require forging as well.



Powerful Technology, Durable Solutions

The benefits

Rods in webs are subject to highly dynamic forces caused by direct load on the web, belt speed, vibrations in the system, and external movement (e.g. mobile conveyors and harvesters). Typically the rods will experience the largest forces in the center of the rod, making it the most likely area where the rod will go through the yield point. Many times, webs will have shakers, enhancing the “dancing” of the webs and thus multiplying forces in the middle.

Wider webs are provided with one or more multiple centers, with the result that riveted rods also have one or more center forges. This forge is the most vulnerable part of the rod, and should at least have the same mechanical properties as the rest of the rod. This is only the case with through-and-through hardened rods.



Rods not hardened through-and-through, do not have constant mechanical values in the cross-section of the rod. Regular spring steel rods have a lower yield strength in the core than in the outer shell of the rod, conversely hardened rods have the same higher values in the core as in the outer shell of the rod.

The higher yield point of our hardened rods means that more force is required to bend the rods. This makes the

rod more resistant to load and is the point at which rods permanently bend further away.

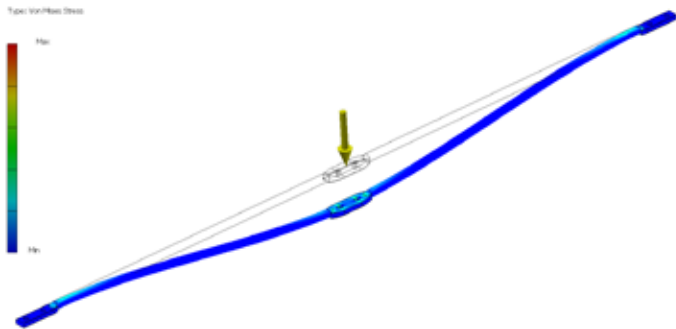
In addition to higher yield, our hardened rods are also more wear resistant to abrasion. These applications would include: stone diggers, digger webs and webs driven in the rods with steel sprockets.



The benefits of heat-treated rods

Broekema's heat treated rods are made from high quality springsteel, with additional elements to further improve tensile strength and yield strength. Broekema forges rods first, before heat-treating them. This ensures the same strength of the rod in the forged areas, as in the rest of the rod. The heat-treating is done in an oven where the hardness is raised to some 63° Rockwell and cooled in a polymer solution. After hardening, the rods are tempered in an oven, according to special formulas with time and temperature, to a hardness of 42° to 49° Rockwell, depending on the application.

Hardened rods are used in applications with higher risk of wear or where rods must withstand more force. These include digging webs, sugar beet webs or webs that are driven by iron sprockets on the rods.



Broekema's heat-treated rods have a constant high hardness over the entire length of the rod. Conversely, other belted chain manufacturers only maintain these values between the forged sections of the rod, as they use pre-treated material and do the forging as the last step in production. As stated, where steel is heated, it loses its original strength. Especially the center forges of the rods where maximum yield and tensile strength is required.

Broekema is the only manufacturer of rod conveyor belting capable of supplying 100% hardened rods. For this very reason, Broekema webs are the preferred choice for machine manufacturers for such heavy-duty applications as potato, beet, onion, carrot harvesting, and many others.



Optimal steel

The alloys used by Broekema to heat-treat, have an optimal composition of the elements chromium, nickel and manganese. These elements, along with the heat treatment, ensure that the rod is stronger and more durable than ordinary spring steel.



Longer life expectancy

Hardened rods last longer. The better life expectancy is because the rods are simply stronger. In applications where rods are subject to higher forces, or when used at limits of what is possible, heat-treated rods offer great advantages. Examples include: faster driving with a harvester, working with more soil on the web, or in areas with heavy soil and/or more or larger stones

