

Pin tube elements provide boilers with an extended heating surface

- and a long service life when you choose OEM* produced elements.

Pin tubes are featured in Aalborg Industries MISSION™ oil-fired boilers, in SUNROD™ CPH, CPDB and CHS boilers, and in Gadelius/SUNROD™ CPH, CPD, CPA and CPDB boilers.

Design background

The unique idea of welding pins to a tube in order to increase its heat transfer area was developed in the 1940s by Swedish engineers and patented world-wide. The success of the pin tube design was so resounding that the company later resumed the name of Sunrod for its boiler business because the pins on the tubes resembled rays of the sun. Today, the company - and pin tube patents - are part of the Aalborg Industries group.

The pins are welded on the tube in a tapered circular pattern. When extending the tube surface with pins, a reduction of the tube length by a factor 8 is achieved as compared to plain tubes.

The fact that many competitors copy the pin tube design into their boilers and heat exchangers testifies to the fact that the pin tube principle remains outstandingly efficient in the convection sections of boilers.

Pin tubes used everywhere

Pin tubes in SUNROD™ vertical oil-fired boilers were introduced for marine use some 50 years ago, and several thousands of our boilers (and heat exchangers) have since been delivered with pin tube elements mounted in the convection zone.

The design has been used with equal success in exhaust gas heat recovery steam generators on ships and in land-based plants. This is the reason why Aalborg Industries' new generation of oil-fired boilers of the MISSION™ brand feature pin tubes as the most vital boiler part where high efficiency, reliability and low weight are characteristics of our products.

Quality focus in production

Production of good pin tubes requires expertise. Substantial resources are constantly invested in R&D to ensure

that the pin tubes can withstand demands that are changing over time. The material of the pins is of a special alloy that ensures the best possible heat transfer to the tube wall. The alloy is fit for automated welding and can withstand flue gas temperatures of approx. 1500°C when welded to a pin tube. Special welding robots designed by Aalborg Industries secure a high and uniform quality of the product.

The geometry of this special pin tube has remained more or less unchanged



over the decades since the pin tube element was invented. Some improvements of the lower connection have been made during the years to make the present design a sturdy solution. The pin tube element is virtually indestructible if the boiler is maintained correctly.



Pin tube element

Long service life

A large number of ships still have the original pin tubes in their boilers when they head for the scrap yards.

The pin tube element is designed for a lifetime that equals the service life of the boiler. However, if the boiler and, in particular, the boiler water is not maintained and kept within specifications, the pin tube may be damaged precisely like other steel components of the pressure vessel.

The most likely causes of damage are various types of corrosion. The most frequent type of corrosion is caused by oxygen in the boiler water. This can be attributed to incorrect use of oxygen scavenger and a too low feed-water temperature.

(See Aalborg Solutions No. 2)

Steel components exposed to high stress will normally be damaged faster than other components. The inlet tube of the pin tube element is a component that is exposed to stress from the boiler pressure and from different thermal expansion between the outer and inner tube when stopping and starting the boiler.

It should be pointed out that the stress levels in the pin tube are well within acceptable limits with properly treated boiler water.

Modifications based on operating experience

Based on Aalborg Industries' long operating experience, the lower section of the pin tube has been re-designed to increase its lifespan. This design improvement was possible due to implementation of new technology within welding techniques and design possibilities.

Furthermore, the reduction of the smoke tube thickness makes the pin tube even more flexible because the modification has reduced built-in stresses. All pin tube elements are carefully heat treated after manufacture to eliminate all stresses induced by the manufacturing processes.

Maintenance prevents damage

Pollutants to the boiler waterside such as oil contamination in the condensate or deposits of limestone inside the tubes may cause damage as well, not only to the pin tube element but to all the heating surfaces of the boiler. *(see Aalborg Solutions No. 3)*

A leak from an inlet bend in a pin tube element is a signal that something is totally wrong with the boiler operation or water treatment. A diagnosis of the cause by one of our service engineers would then be a good investment in order to prevent a more serious damage.

Repair by total replacement

A leaking pin tube element should always be replaced completely. This means replacing the pin tube element in its whole assembly with the smoke tube because only correct fabrication

procedures by a professional OEM workshop can guarantee the lasting quality of a pin tube element. Based on our decades of experience, any repair of the pin tube element from the fire side will result in temporary tightness but the tube bend will quickly leak again.



Buy OEM elements - Avoid the copycat

Several copies of pin tubes and pin tube elements are available in the market today. None of them include the modifications made by Aalborg Industries that we have made based on operating experience and extensive R&D combined with the most advanced welding techniques. The life of the copycat products is likely to be short.

Did you buy your pin tube element from the Original Equipment Manufacturer?



Pin tube element