

PRODUCT INFORMATION #1

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Indirectly-heated rotary kilns for demanding situations and bulk materials of ultra-high purity

Indirectly-heated rotary kilns are used for a wide range of applications and have to meet the ever-growing and present-day, challenging processing requirements of the industry. The desire for maximum productivity, partly combined with exotic and aggressive feedstocks, requires a high knowledge and experience for choosing the most suitable material for the kiln.

The requirements on rotary kilns are diverse. For each individual case various parameters must be taken into account. The following criteria have to be considered:

- Application temperatures
- Creep resistance (→ service life)
- Dimensional stability
- Resistance to oxidation /dry corrosion
- Abrasion resistance
- Protection against contamination of the produced material

It is often the combination of several factors that justifies the use of high-quality rotary kilns. The stainless steel and high alloy specialist Schmidt + Clemens based in Lindlar/Germany produces rotary kilns for demanding situations by using the centrifugal casting process, which offers many advantages and has proven itself to be extremely useful in the high temperature range. In addition to standard solutions, there are in particular rotary kilns in the portfolio, which are developed or further developed in a close cooperation with plant manufacturers and users.

In addition to increasing the service-life of rotary kilns, users are particularly looking for a trouble-free operation. In this respect protection against contamination of the feedstock has proven to be a real challenge. Conventional heat-resistant steels and alloys form a chromium oxide surface layer during operation at temperatures $\geq 950^{\circ}\text{C}$, which is relatively porous and brittle. This not only promotes oxidation and corrosion, which continuously weaken the kiln, but also leads to the release of chromium oxide particles. With increasing length of time and temperature these undesirable particles mix with the feedstock and are finally found in the finished product.

Especially in the production of high and ultra-high purity aluminum oxides, better known as alumina, protection against contamination is very important. High purity alumina has a wide range of applications, for e.g. as a catalyst carrier in the automotive, chemical and petrochemical industries. In addition, high and ultra-high purity alumina are found in abrasives, light emitting diodes, lasers, photo printing paper, in scratch-resistant lenses and watch glasses as well as in artificial hip joints.

The quality of the high-purity powder is, amongst others, determined by the raw material and the process parameters, often with temperatures $\geq 1200^{\circ}\text{C}$. However, temperatures $\geq 1100^{\circ}\text{C}$ are very stressful for rotary kilns made from commercial heat resistant sheet metal. Such elevated temperatures often lead to deformation of the tubes due to the limitation of their mechanical strength, but above all, chromium oxide particles are released from the inner surface layer, which leads to rejection or to devaluation of the produced material.

The solution for this are rotary kilns made of aluminum-containing Ni-Cr alloys of the Centralloy[®] HT alloy family. The patented alloy compositions ensure a very resistant material structure and the formation of a dense and firmly adhering protective layer with ceramic properties (Al_2O_3) that protect the tube from oxidation and corrosion, thus effectively prevent contamination of the production material with chromium oxide particles. Operating temperatures of up to 1250°C are possible in continuous operation, which is unique. In addition, rotary kilns made in Centralloy[®] - centrifugal cast alloys are extremely durable, which has been proven in various applications. In addition to rotary kilns for the production of high and ultra-high purity aluminum oxides, S+C also offers solutions for rotary kilns of other applications, including the production of color pigments, refractory metal and battery powder, recycling, etc.

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