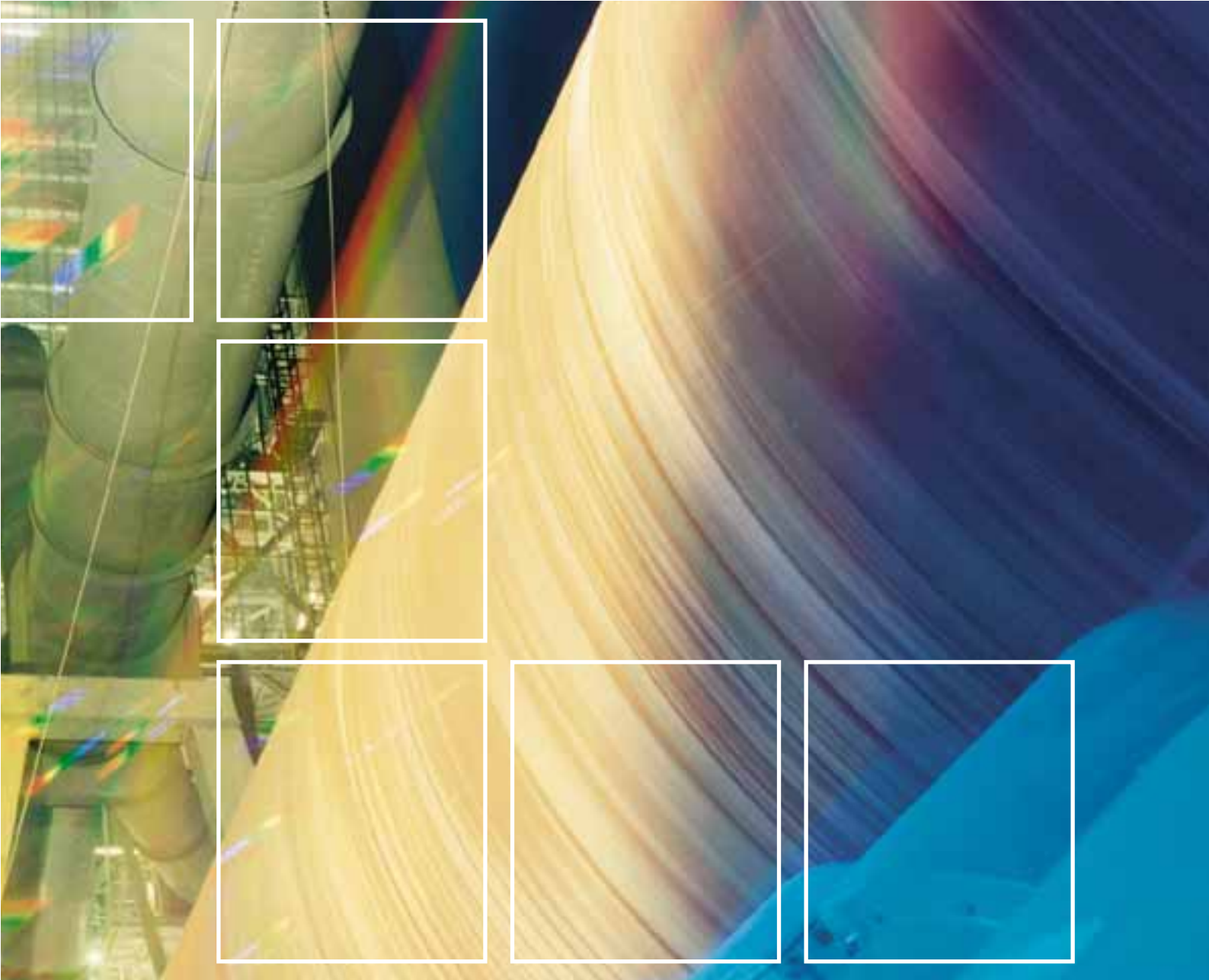


Polysius rotary kiln.

Centre piece of the pyroprocessing system.



A company of
ThyssenKrupp
Technologies

Polysius



ThyssenKrupp

Rotary kilns from Polysius: economical – reliable – resource-saving.

In 1899, Polysius put Europe's first rotary kiln into operation. In those days, rotary kilns were a maximum of 2 m in diameter and 20 m in length, managing daily outputs of 30 to 50 tonnes of cement clinker per day. Nowadays, production capacities of 10,000 tonnes per day are nothing unusual.

Today, the demands of the industry with regard to quality, maximum capacity and minimum costs have become the decisive factors for competitive strength. And that is why...

- robust and reliable design,
 - low resource consumption,
 - high operating reliability and
 - low specific operating costs and capital expense
- are the most important elements in the success of Polysius kiln technology.

Since the introduction of the rotary kiln, Polysius has constructed more than 1,500 production lines worldwide. Polysius kiln lines are used in the cement and refractories industry, in the chemical industry, in the iron and steel producing industry and in the mineral processing industry.

Due to optimisation of the overall pyroprocessing concept, modern rotary kilns have significantly smaller dimensions and thus require less capital investment than their predecessors, despite their higher output rates.

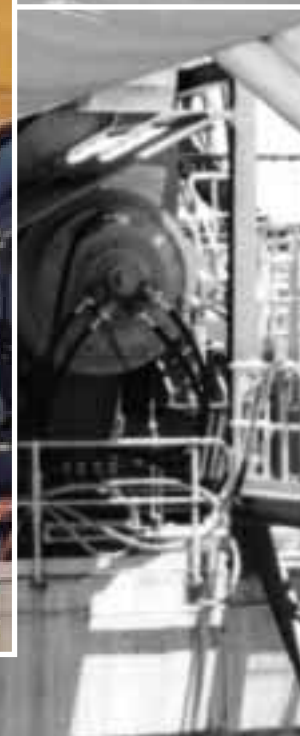
The actually required kiln dimensions essentially depend on the raw materials and fuels to be used, the plant configuration, the quality of the cement clinker and on the desired production capacity. Taking these factors into account, the optimum kiln shell dimensions are accurately determined with the aid of laboratory test processes, computer simulations and design calculations.

Thanks to the use of modern precalcination processes, rotary kilns nowadays seldom need a length to diameter ratio above 15:1.

Up to this L/D ratio, Polysius offers both the classical 3-support kiln and the modern POLRO® two support kiln. For the first time, rotary kiln dimensioning can therefore concentrate on suiting the characteristics of the material and the burning process, without having to take the actual kiln system into account.



POLRO® two support kiln for a cement clinker output of 4,900 tpd in Australia.





5,000 tpd cement clinker kiln on 3 roller stations.



Splined kiln tyre fixture.





POLRO®
Knowhow to
the last detail.

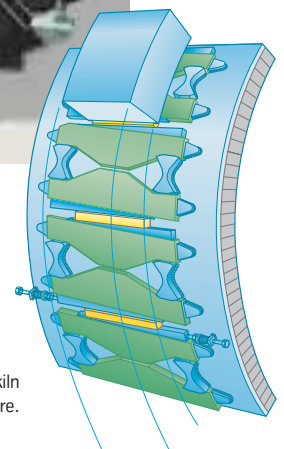


The POLRO® is a directly driven rotary kiln with a statically determined support configuration using just two roller stations. The kiln shell is supported in splined tyres on tilting rollers that align themselves to provide optimum contact conditions. It is directly driven via the inlet-end roller station, a system which supersedes the conventional girth gear and pinion drive. Pneumatic inlet and outlet seals and an air-cooled inlet trough round off the POLRO®. Thanks to the statically determined kiln support configuration, POLRO® owners benefit from high operating reliability, minimal maintenance and inspection requirements and very low operating costs.

Self-aligning supporting rollers

For effective transmission of the torque, perfect contact conditions are required between

Electro-hydraulic drive system with 4 drive units.



Splined kiln tyre fixture.

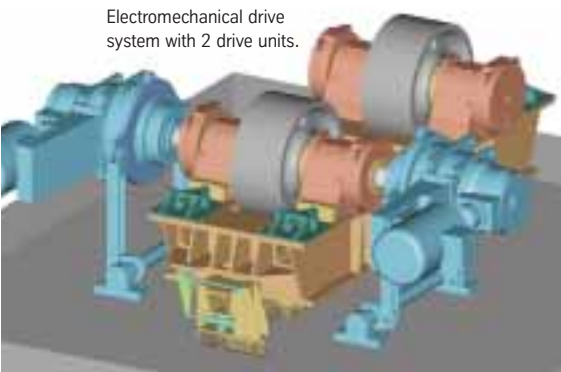
Assembly of
a POLRO®.



the driven rollers and the kiln tyre. The supporting rollers therefore have to compensate for the negative results of a thermally distorted kiln shell or foundation settlement without affecting the stability of the kiln support system.

In order to effectively satisfy these two contrary demands (optimum alignment of the contact surfaces of roller and tyre and safe, stiff support of the kiln shell), the roller bedplates also have a self-aligning mounting on two axial pivoting bearings. These axial pivoting bearings absorb the supporting and spreading forces of the kiln shell and, due to their universal joints, can follow any wobbling of the tyre. This ensures that the contact pattern is uniform under all load conditions while reliably preventing edge contact of the tyre and rollers.

Electromechanical drive
system with 2 drive units.



In order to prevent contact surface wear during operation of the POLRO®, the axes of rotation of supporting rollers and kiln tyres are always parallel. This is ensured by a positioner, which adjusts the rollers relative to the tyre during the kiln operation.

The positioner also serves as an axial roller thrust system, with the same effect as the familiar axial kiln thrust system. The kiln is held in position by a single thrust roller.

Splined kiln tyre

Direct driving of the supporting rollers requires splined tyres for transmitting the torque to the kiln shell. The splined tyre's internal tothing forms a positive connection with the kiln shell all around its circumference. The entire weight of the kiln is supported tangentially on the internal tothing of the tyre and the tangential transmission of the load keeps the kiln shell round under all operating conditions. As constriction of the kiln shell is impossible, the service life of the refractory lining is greatly increased.

Direct drive system

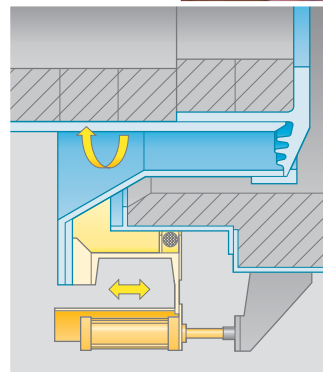
The drive system of the POLRO® rotary kiln is simple

and robust. Also, the maintenance requirement is low, due to elimination of the otherwise necessary maintenance of a girth gear and pinion mechanism. Depending on requirements, both or only one of the supporting rollers of the inlet-end kiln tyre station are driven. The drive system can be electromechanical or electrohydraulic.

Measurements taken to establish the maximum usable friction for transmitting the driving torque demonstrated that the employed friction drive is able to transmit 8 to 9 times the actual operating torque of the kiln. As this figure greatly exceeds the maximum torque of the motor, slipping of the drive roller is impossible in any conceivable operating condition.

Inlet and outlet seals

The pneumatic inlet and outlet seals adapt themselves to the different rotational, radial and axial movements and thus prevent infiltration of false air into the kiln system.



Pneumatic rotary
kiln outlet seal.

Air-cooled kiln
inlet trough.



Because Polysius rotary kiln seals are highly efficient, robust and wear resistant they save energy and are extremely durable.



3-support kiln.



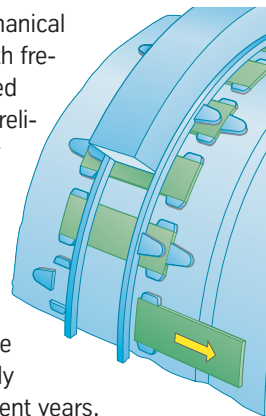
Rotary kiln supported on 3 roller stations.

If the length to diameter ratio is above 15, it is advisable to support the rotary kiln on three roller stations.

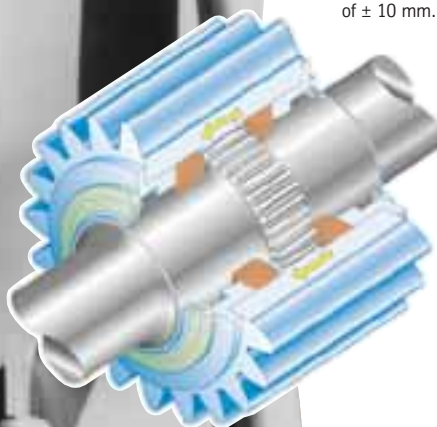
Polysius provides numerous innovative detail solutions that ensure economical pyroprocessing. Some of our proven components are used for both the 2-support and the 3-support kiln. These are the variable-speed electromechanical drive system with planetary gear unit, the splined kiln tyre, the inlet and outlet seals, the air-cooled inlet trough, and the hydraulic axial thrust system. However, the drive system with self-aligning pinion and the floating tyre (as a more favourably priced alternative to the splined tyre) are specific features of the 3-support kiln.

Drive system with self-aligning pinion

The electromechanical drive system with frequency-controlled speed is a very reliable solution for the 3-support kiln. Planetary gear units directly flange-mounted on the pinion shaft have been increasingly employed in recent years.



Self-aligning drive pinion: the design permits a tilting of ± 10 mm.



The use of a self-aligning pinion ensures that an optimum contact pattern is achieved over the entire width of the tooth gearing. The self-aligning pinion compensates any thermal distortion of the kiln shell and associated wobbling of the girth gear. In comparison to the rigid drive mechanism, the dimensions of girth gear and pinion are about 20 % smaller, due to the improved tooth

Kiln system with 3-support kiln in Argentina.

Modern control room with POLCID® NT process automation system.



Dual rotary kiln drive with planetary gear unit.

Bearing stations

The compact and stable bearings of any roller station are interchangeable. They are designed as plain bearings with oil scooping system and their seating on the bedplate is self-centring, so that an optimum contact pattern in the bearing is always maintained.

Floating kiln tyre

As an alternative to the splined tyre, Polysius offers the floating tyre, which is only secured on the kiln shell in the axial direction. This means that it can turn in the circumferential direction relative to the kiln shell.

The fastening system of the floating tyre consists of bridge plates which engage positively with the kiln shell. Retaining elements secure the fastening system in the circumferential and axial directions.

Floating-tyre fixture.

Automation solution for optimum process control

In order to meet the constantly increasing demands imposed on process control systems while also promoting the economical and competitive operation of kiln plants, Polysius offers process knowhow in the form of the POLEXPERT®-KCE automation system. This is the logical completion of our range of process technological systems.

By linking current process data and expert knowledge, POLEXPERT® systems enable automatic expert system process controlling in every operating situation. With this automatic operation, the installed machines are consistently run at an optimum utilisation rate. As a result, emission rates are low, wear is minimised, energy consumption is reduced and the personnel are relieved of routine tasks.

Combination of the POLEXPERT® with the POLCID® NT master process control system provides a highly effective automation solution for monitoring, controlling and optimising the kiln plant.

POLSCAN® measuring system

Foundation subsidence, uneven wear and faulty alignment of the supporting rollers – e.g. after repair work – cause kiln axis deviations.

To permit quick and precise diagnosis and correction of rotary kiln axis misalignment, Polysius offers the POLSCAN® service. Using an optoelectronic measuring system, the kiln components are precisely surveyed and readjusted without interrupting operation. The analysis and documentation of the measured data is performed directly on the spot.

POLSCAN® measurement of a rotary kiln.



bearing pattern and the full frictional connection. This back gear unit is also a favourably priced refurbishment measure for existing kilns.