

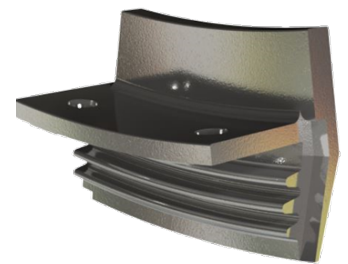
Kiln outlet protective segment with optimised geometry

Requirement for longer service lives

The so-called protective segments form the end edge of a rotary kiln outlet. The standard polysius® protective segments have integrally cast cooling ribs to reduce the core temperature of the segment by means of the cooling air introduced via the ring nozzle, from outside the rotary kiln outlet. With this protective segment, the „segment clamping shoulder“ forms the discharge edge for the finally-burned clinker and simultaneously gives the refractory lining the necessary counter-hold. Due to the enormous thermal load and mechanical stress on the segments, service lives of less than one year are often observed. Here, damage symptoms that are often seen are heavily worn segment clamping shoulders or red hot segments during operation.

An alternative that is not always applicable, depending on the space conditions in the kiln hood, are protective segments with an applied refractory coating.

However, the requirement was to develop a segment for use with all kiln hood variants and with a service life of 1–2 years.



Standard thyssenkrupp Polysius protective segment

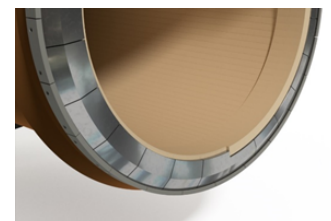
Cooling rib geometry determined by means of CFD resulted in a patented Polysius design

The best compromise between the pressure drop, the resulting turbulence and the cooling effect is achieved via special diamond-shaped cooling rib geometry. This reduces the maximum temperatures in the protective segments by 240 °C and thus significantly reduces the thermal load on the segments.

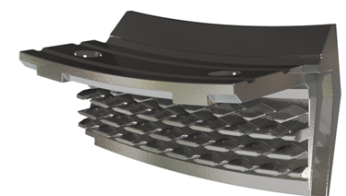
The geometry of the segment clamping shoulder was optimised in such a way that it is now covered by the last row of bricks and no longer has direct material contact. Despite the segment clamping shoulder having a bevel of 45°, there is still good wedging of the refractory lining.

The last row of bricks now forms the discharge point for the finally-burned clinker. Direct material contact and temperature input are thus avoided.

The lower thermal loading due to the new diamond-shaped cooling ribs (50% more cooling area) and the lack of material contact (21% less heating surface) now allow longer service lives. In particular, this is due to the increase in material strength as a result of lower thermal loading (30% lower temperature, according to CFD analysis) and lower oxidative wear.



Comparison of new and old discharge edge



Patented Polysius design

Kiln outlet protective segment with optimised geometry



New development (not only) for thyssenkrupp Polysius kilns

The new protective segment is a 1:1 replacement for the standard polysius® kiln outlet design.

Fastening by means of countersunk pins and forked wedges is a well-proven system and is retained in full. Against this background, the external geometry of the segments remains completely unchanged, except for the cooling ribs and segment clamping shoulder mentioned.

The only adaptation that has to be carried out when installing concerns the last row of bricks during installation of the refractory lining, in order to adapt it to the 45° slope of the protective segment.

The refractory bricks serve as additional wear protection for the segments and can also be replaced without removing the said segments. A further advantage is rapid amortisation thanks to a longer service life. Casting patterns for commonly-used nominal diameters are also available.

Successful installation in 2019

Initial installation took place in January 2019, with commissioning being carried out in April 2019. The customer is completely satisfied and is now starting the fifth year of operation with the same segments.

It was thus possible to achieve double the initially planned service life of two years.



Appearance after nine months, three years and four years

Your advantages:

- „Made in Germany“
- Rapid amortisation thanks to a longer service life
- Casting patterns available for commonly-used polysius® nominal kiln diameters
- Compatible with the old design of the standard thyssenkrupp Polysius kilns
- External design remains almost unchanged

Your contact person:

Jens Opperbeck
jens.opperbeck@thyssenkrupp.com

Michelle Rollié
michelle.rollie@thyssenkrupp.com

Further information can also be found in our service flyer „Kiln outlet segments“.

<https://www.thyssenkrupp-polysius.com/en/downloads>