Phasecon Mining
A DIVISION OF PHM GLOBAL

Our Revolutionary Retort Tube

Unlocking Efficiency

GLOBAL
EXPERTISE
LOCAL
PASSION

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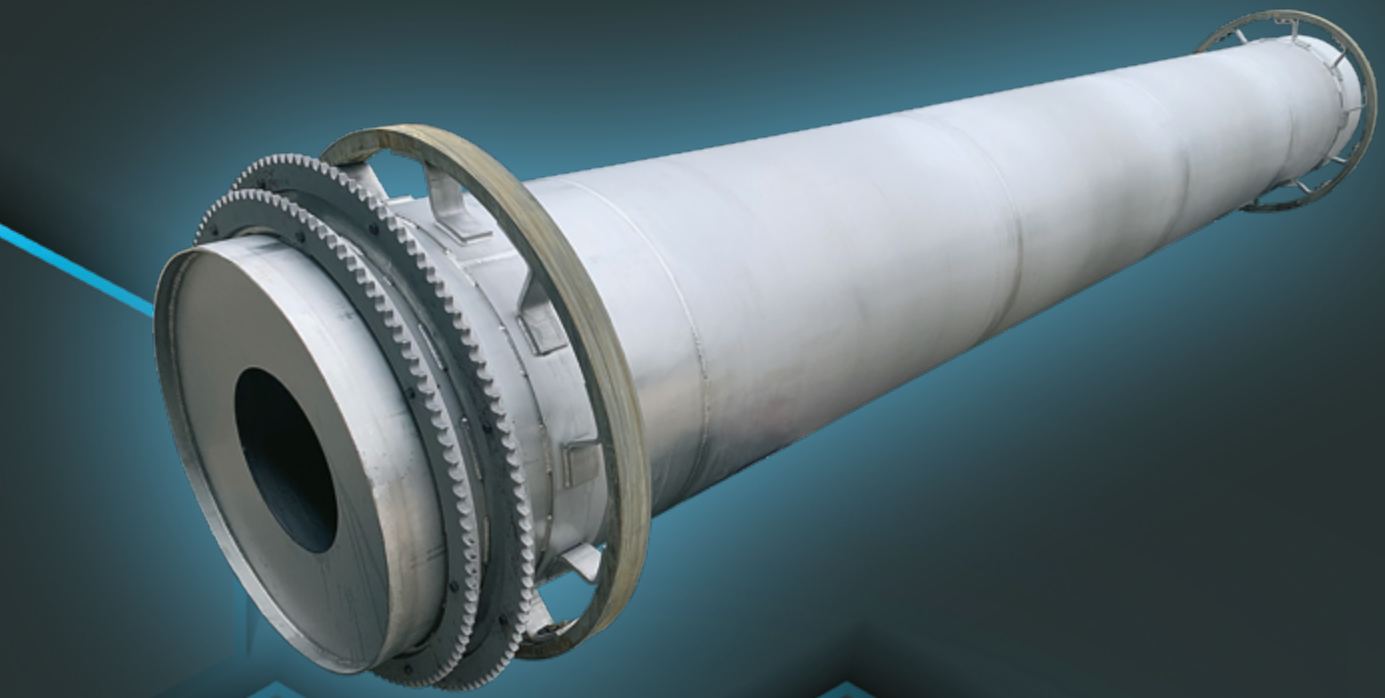
UNLOCKING EFFICIENCY

At Phasecon Mining, a division of PHM Global, we're dedicated to pushing the boundaries of efficiency and innovation in industrial processing. Our latest breakthrough – the revolutionary Retort Tube – is poised to redefine the standards of **heat transfer technology**.



UNMATCHED PERFORMANCE

With **specially designed lifters** that magnify surface contact, our retort tube maximizes heat transfer efficiency, ensuring uniform heating and unmatched performance.

Discover how our cutting-edge solution can save you money and boost your processing capacity.

Phasecon Mining's retort tubes feature a barrel section, geared head section, and two support rings. The head section seals against the screw feeder hopper interface plate, with drive sprockets and support riding rings bolted on for easy replacement.

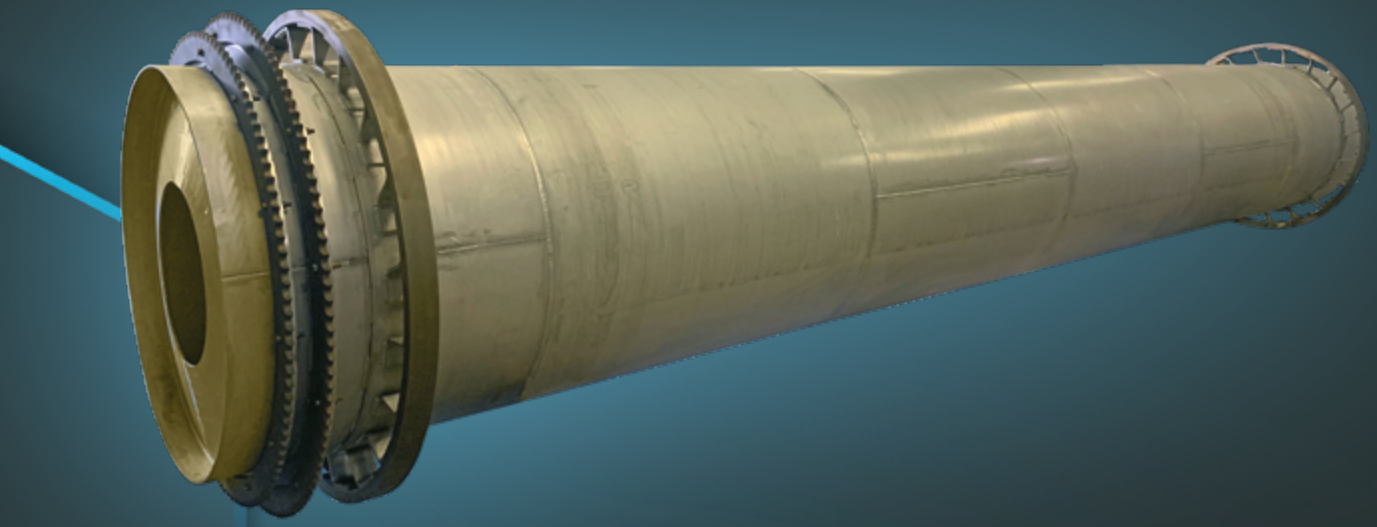
Our design allows for lifters inside the tube to **optimise carbon mixing** and **ensure sufficient contact time** with the tube wall for heat transfer.

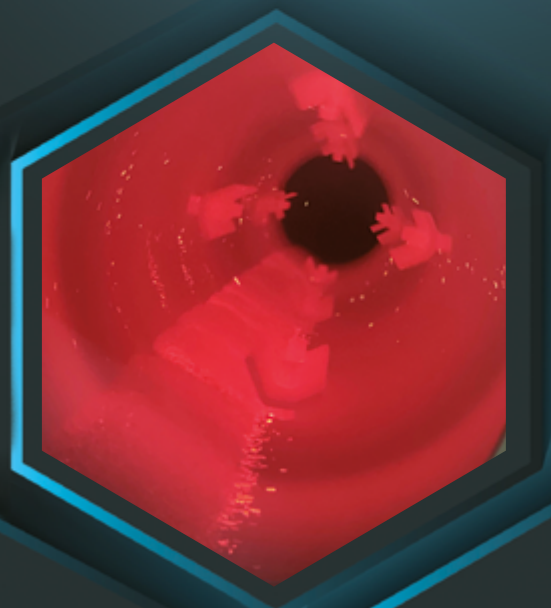
We offer **various construction materials** and **tailor our solutions** to meet customer requirements.

UNLEASH EFFICIENCY WITH OUR RETORT TUBE

Experience the Future of Heat Transfer Technology

- Innovative lifter design for maximum surface contact.
- Uniform heating ensures consistent quality.
- Customizable solutions tailored to your needs.





COMMON CAUSES OF RETORT TUBE FAILURES

1. Material Selection: The choice of material significantly impacts the performance and longevity of retort tubes. Improper material selection can lead to corrosion, deformation, and structural failures.

Our Solution:
Typically, Phasecon Mining's retort tubes are manufactured out of 310 Stainless Steel.

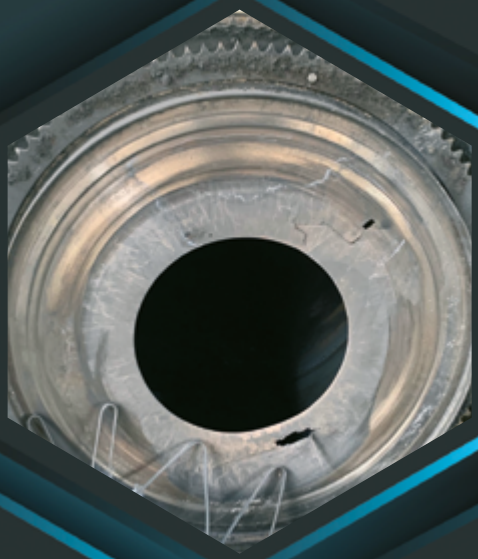
Retort tubes manufactured from 310 stainless steel have been reported to be a superior material selection to the industry norm of 321 stainless steel.

The superior 310 Stainless Steel material offers the following benefits:

- Less deformation with the selections of 310 s/s material.
- Takes longer to develop creep stress.
- Five times more capacity to withstand rupture due to creep stress.
- 20% higher continuous operating temperature exposure acceptance.
- High Chromium & Nickel content ensures improved resistance to oxidation and corrosion, as well as is capable of applications in reducing sulphur atmospheres containing H2S.

2. Front Seal Plate Failure: Incorrect installation and inadequate clearances between surfaces can cause front seal plate failure, resulting in leaks and efficiency loss.

The front interface seal plate on a retort tube can fail if the screw feeder interface seal plate is incorrectly installed, leading to insufficient clearances between these surfaces.



COMMON CAUSES OF RETORT TUBE FAILURES

3. Seal Plate Welding Failure: Carbon abrasion due to continuous feed into the retort tube can lead to welding surface wear and eventual failure over time.

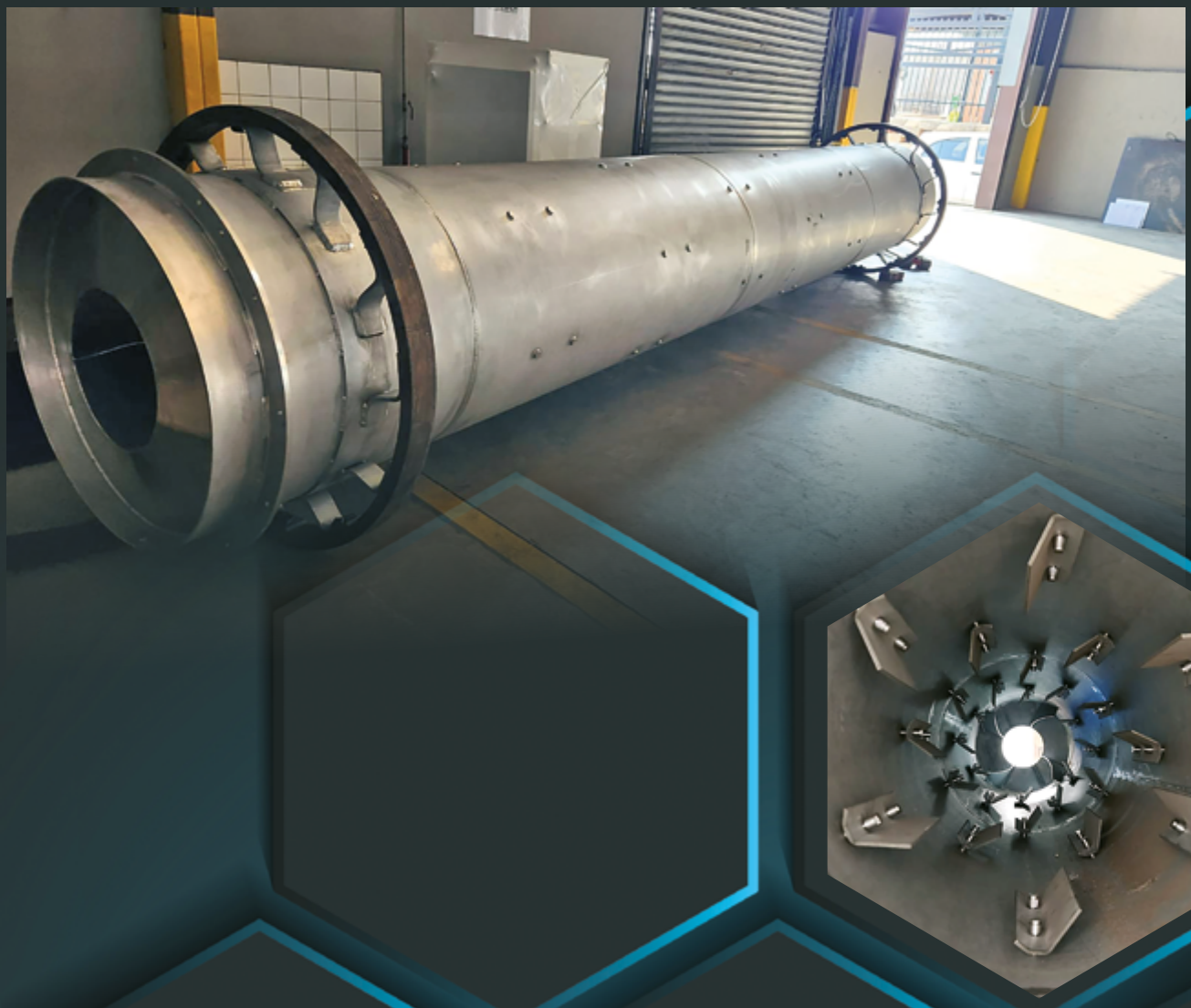
4. Retort Tube Rupture: Overload conditions, thermal stress, and inadequate material strength can contribute to retort tube rupture, posing safety risks and production downtime. Rupture strength is the stress required to cause rupture under specified environmental conditions. Creep rupture, or stress rupture, is the process where a material under a constant high load creeps to failure. Creep failure happens when accumulated creep strain causes deformation beyond design limits.

5. Retort Tube Deformation: caused by over-temperature conditions, thermal shock from water ingress, overloading due to blocked discharge chutes, and uncontrolled heating.

6. Riding Ring Supports – Spokes Failure: The spokes could fail due to welding issues or loose bolts during operation.

PREVENTIVE MEASURES FOR RETORT TUBE FAILURES

- Conduct **thorough material analysis and stress testing** to ensure proper material selection for retort tube construction.
- Implement **regular inspection and maintenance protocols** to detect and address potential failure points, such as front seal plates and welding surfaces.
- **Monitor operating conditions,** including temperature, load, and material flow, to prevent overload and thermal stress on retort tubes.
- **Collaborate with us** for expert guidance and customized solutions to optimise retort tube performance and reliability.



RETORT TUBE MATERIALS OF CONSTRUCTION: 321 STAINLESS STEEL

321 Stainless Steel: Known for its improved corrosion resistance and strength at high temperatures, suitable for service within the sensitizing temperature range.

The key features of 321 Stainless Steel:

- It is a **chromium-nickel steel** which was developed with improved intergranular-corrosion resistance. Its resistance to sensitization, coupled with its higher strength at high temperatures makes it popular for service within the sensitizing temperature range of 450 - 850°C.
- It **must never be used in highly oxidising environments** as it is liable to 'knife-line' attack – (knife-line attack is a type of intergranular corrosion that typically occurs along adjacent or connected weld posts, heated into a temperature range suitable for sensitization)
- **Resistant** to atmospheric corrosion, sterilizing solutions, many organic chemicals, and a wide variety of inorganic chemicals.
    - The materials **cannot be hardened through heat treatment,** only cold working.
    - **Not suitable for chloride solutions,** where it is susceptible to pitting and crevice corrosion.

Recommended maximum service temperature (Oxidising Conditions)

- Continuous Service 950°C
- Intermittent Service 870°C

Temperature ° C	500	550	600	650	700	750	800	850
Properties at Elevated Temperatures MPa			390	329	280	230	190	140
Stress to develop a creep rate of 1% (10000 hours) Mpa		180	100	70	40		10	
Stress to develop a creep rate of 1% (100000 hours) MPa		120	80	50	25		5	
Rupture Creep Stress (1000 hours) MPa	270		180	140	70		30	
Rupture Creep Stress (10 000 hours) MPa	240		130	90	50		10	
Rupture Creep Stress (100 000 hours) MPa	200		90	50	15		5	

RETORT TUBE MATERIALS OF CONSTRUCTION: 310 STAINLESS STEEL

310 Stainless Steel: Ideal for high-temperature applications, offering excellent resistance to oxidation, sulphidation, and carbonization. Phasecon Mining's retort tubes are typically made from 310 stainless steel, **a superior material offering several benefits:**

- **A medium carbon austenitic stainless steel** used for high-temperature applications.
- Popular for applications for continuous services up to 1050°C.
- 310 being an austenitic stainless steel **cannot be hardened by heat treatment.**
- Has **good resistance to oxidation** in intermittent service in air up to 1035°C and 1050°C continuous service.

Recommended maximum service temperature (Oxidising Conditions)

- Continuous Service 1150°C
- Intermittent Service 1035°C

Temperature ° C	500	550	600	650	700	750	800	850	900	950	1050
Properties at Elevated Temperatures MPa		550		430		280		180		90	50
Stress to develop a creep rate of 1% (10 000 hours) Mpa		110	90	70	40	30	15				
Stress to develop a creep rate of 1% (100 000 hours) MPa		90	75	50	30	20	10				
Rupture Creep Stress (1000 hours) MPa			190		110		50		35		15
Rupture Creep Stress (10 000 hours) MPa			170		70		35		20		10
Rupture Creep Stress (100 000 hours) MPa			110		55		25		10		2

Phasecon Mining
A DIVISION OF PHM GLOBAL

Unlock Efficiency Today with Our Revolutionary Retort Tube

Discover the power of efficiency with Phasecon Mining's innovative Retort Tube. Contact us today to learn more about how our cutting-edge technology can transform your operations and drive success.

CONTACT US

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