

Metso:Outotec

Calcination solutions

Coke calcining systems





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Metso Outotec provides systems and equipment for thermal processing of solid materials such as ores, minerals, bulk granular chemicals, agricultural products and waste materials to change their physical and/or chemical properties.

With over 80 years of successful experience in minerals and chemical processing, Metso Outotec has the proprietary technology and know-how to design and build coke calcining systems that are best suited to the specific requirements of each customer.

Proven experience

Metso Outotec is the world's leading supplier of coke calcining systems and equipment, having furnished 50 plants representing approximately 70 percent of the world's coke calcining capacity.

Product quality

Metso Outotec coke calcining systems produce a quality product specification from sponge and needle pitch cokes. The real and vibrated bulk densities are optimized in the rotary kiln calcining system. Also, fines in the calcined product are decreased thus enhancing critical elements of product quality.

Energy efficient

Due to the rotating action in a rotary kiln, the coke bed is in constant gentle motion exposing coke particles to the process heat. Additionally, the incinerator will convert volatile matter and fine coke particles entrained in the kiln exit gases into energy for steam and/or electrical power generation.

Flexibility in operations

Metso Outotec rotary kilns can handle a wide range of green coke feeds including needle, shot, fluid or tar pitch cokes. The rotary kiln is also able to optimize the coke calcining operating parameters, such as time, temperature gradient and heat up rate - all of which can greatly impact product quality.

Optimize your rotary kiln system

Rotary kiln

The rotary kiln is a tried and proven technology successfully used in various pyro-processing industries around the world. Rugged construction and conservative design is the trademark of rotary kilns. Operators find them easy to operate and maintenance is minimal.

Calcining of petroleum coke is done in the rotary kiln. The kiln components consist of shell, tires, carrying stations, seals, refractory and a drive train, which includes girth gear, pinion, speed reducer and variable speed motor. The drive train also includes an auxiliary drive for use during startup and periods of power failure.

Burner systems

Process heat is furnished to the rotary kiln from two sources. The first is the kiln burner system, which can be designed to handle gaseous, liquid or solid fuels. The second source of process heat is the burning of a controlled amount of the evolved volatile matter and a small amount of coke fines in the kiln.

Combustion of volatile matter is enhanced by the introduction of secondary and tertiary combustion air. Secondary air is introduced through the firing hood, and tertiary air introduced through ports in the kiln shell to control combustion of the volatile matter and coke fines. Tertiary air utilization results in a significant reduction in kiln fuel requirements.

Afterburners

Cylindrical afterburners are designed for sufficient residence time, temperature and effective mixing to affect the required volatile matter and particulate combustion. Combustion air to the afterburner is furnished by a combustion air fan and preheated air from the cooler exhaust system. Afterburners can be designed for 100% firing capacity when the kiln is down, thus providing the operator uninterrupted steam production and/or electrical power generation.



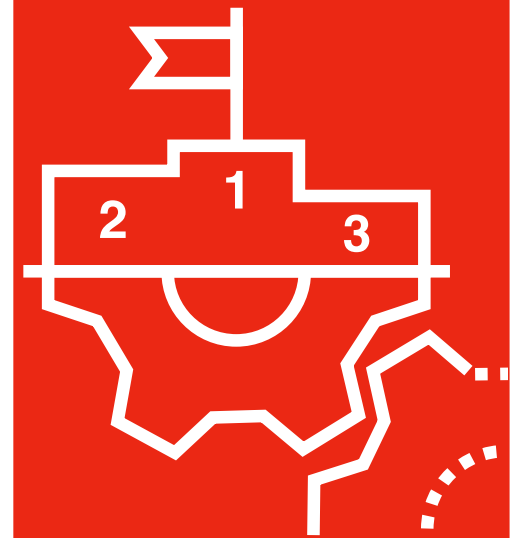
Two 250,000 MPTY Rotary kiln coke calciners



Heavy duty carrying salon



Efficient cylindrical afterburner



Metso Outotec
is the world's
leading supplier
of coke calcining
systems and
equipment.



The Yuanxin project, China



CNOOC, China - Kiln

Coolers

Metso Outotec's rotary cooler design utilizes both a direct water quench of the hot coke at the cooler entrance as well as a counterflow movement of ambient air to cool the coke. The direct quench type is the most widely used method of cooling in the coke calcining industry.

Heat recovery/air pollution control equipment

Metso Outotec's total project capabilities provide the client with a 'one stop shop' approach. Thus, waste heat boilers are included in our total equipment package to recover a large percentage of heat released in the afterburner and air pollution control systems. This supports our customers meet their applicable environmental regulations.

Kiln feed pipe

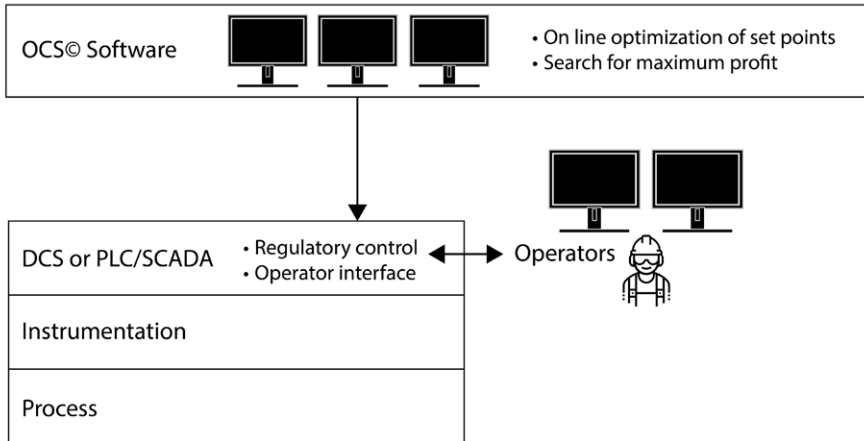
The stainless steel double wall construction, refractory lining and forced fluid cooling of the pipe enhances the design reliability and extends its operating life. A carbon steel 'Y' piece outside the kiln hood also provides easy cleanout access.

Air seals

Metso Outotec's air seals (marketed as Goodeal and Superdeal seals), with their overlapping steel plates, provide an air seal that significantly reduces ambient air infiltration into the rotary kiln. By limiting air infiltration, fuel efficiency is improved and power consumption is reduced. The seals' simple yet effective design requires little maintenance and allows for easy replacement.

Benefits of Metso Outotec Coke Calcining Systems

- Higher quality product specification
- Increased flexibility
- Improved energy efficiency
- Smaller fines in the calcined product
- Extended operating life
- Higher reliability
- Easy and safe maintenance
- Reduced kiln fuel requirements
- Proactive control system for maximized optimization



Programmable Logic Controller (PLC)

A Programmable Logic Controller (PLC) – the heart of the control system – provides monitoring and interlocking functions. The PLC constantly checks for any abnormal conditions. Based upon its intended sequence, the PLC will take appropriate corrective action to keep the process or sequence within proper operating conditions.

Metso Outotec programs and pre-commissions the PLC at its facility or sequence within proper operating conditions. This happens at the PLC'S facility before shipping to the calcining plant.

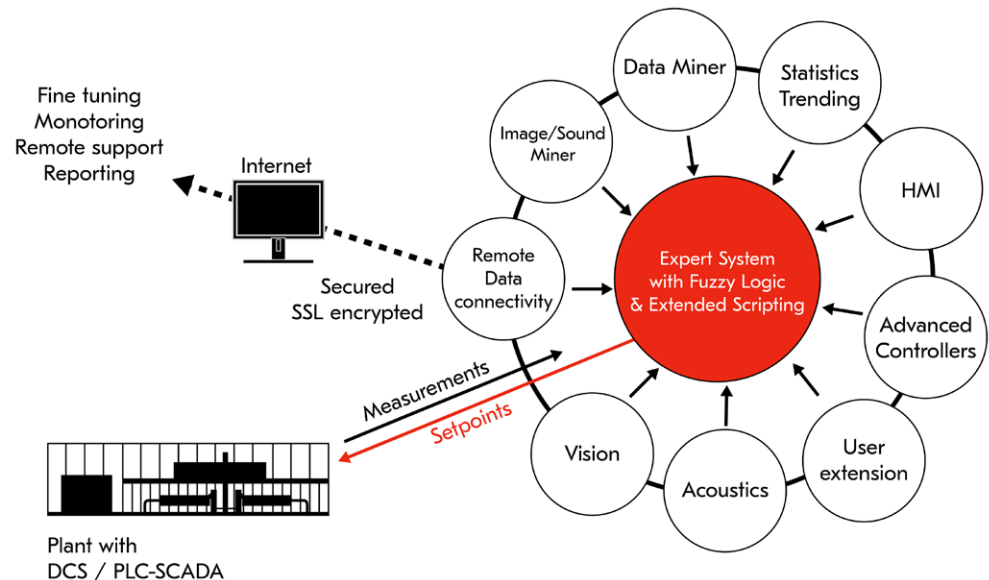
Metso Outotec also supplies the Man-Machine Interface software, which provides access to the operating system through industrial personal computers. The total coke calcining plant, as well as exploded details of sections of the plant area, are readily available to the system operator through the graphic screens provided by Metso Outotec.

Optimization Control System (OCS)

The Metso Outotec Advanced Process Control (APC) system for Coke Calciner will significantly contribute to achieve the process goals, with the following additional benefits:

- Improvement of the energy efficiency of the process
- Stabilization of the process around an increased average production
- Better management of operating constraints and the life span of consumables (refractory bricks)

Additionally, implementation of Optimization Control System (OCS-4D™) control allows the operator to focus on other process issues and provides a consistent way for management to implement control with correct economic objectives. OCS-4D™ advanced control systems are also useful for improving the skills of the personnel, with the operators learning from the system as it explains its decisions.



Technical specifications

Reference number	
101	Kiln feed bin
102	Weigh feeder
103	Feed hood
104	Rotary kiln
105*	Tertiary air system
106	Firing hood
107	Firing system
108	Secondary air fan
109	Transfer chute
110*	Cooler inlet with water quench
111	Rotary cooler
112	Cooler discharge housing
113	Dust collector
114	Product conveyer
115	Cooler exhaust fan
116	Afterburner
117	Bypass and draft control guillotine dampers
118	Waste heat boiler
119	Induced draft fan
120	Natural draft stack
121	Baghouse dust collector
122*	Dust bin
123*	Control room
124*	Mcc room
125*	Sox removal system

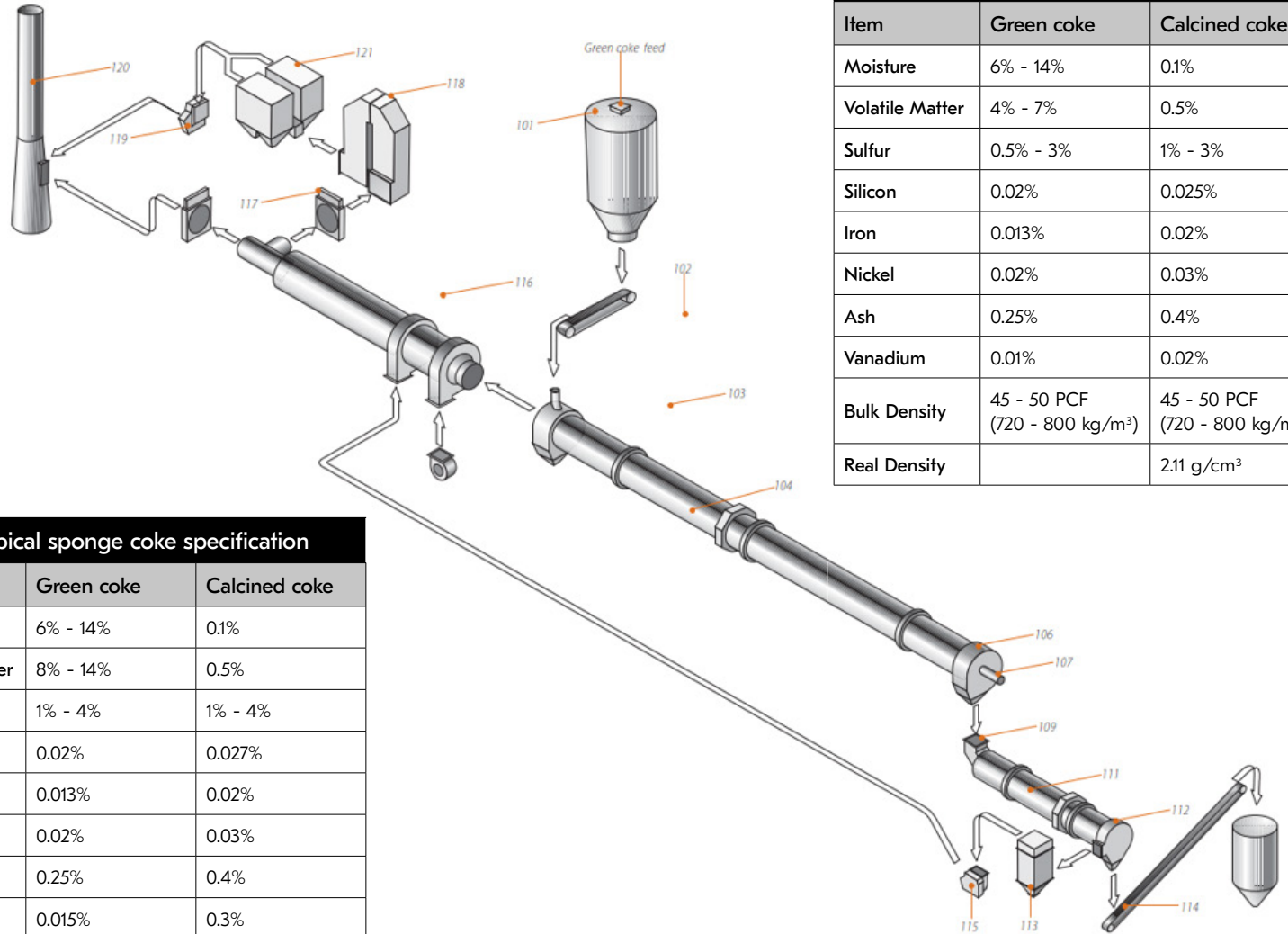


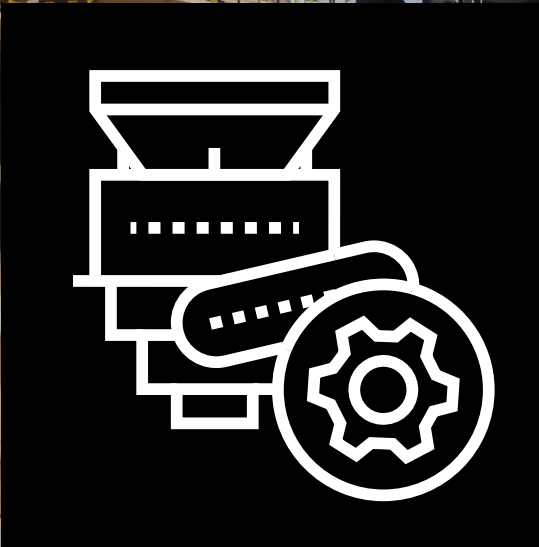
Table 2. Typical needle coke specification

Item	Green coke	Calcined coke
Moisture	6% - 14%	0.1%
Volatile Matter	4% - 7%	0.5%
Sulfur	0.5% - 3%	1% - 3%
Silicon	0.02%	0.025%
Iron	0.013%	0.02%
Nickel	0.02%	0.03%
Ash	0.25%	0.4%
Vanadium	0.01%	0.02%
Bulk Density	45 - 50 PCF (720 - 800 kg/m ³)	45 - 50 PCF (720 - 800 kg/m ³)
Real Density		2.11 g/cm ³

Table 1. Typical sponge coke specification

Item	Green coke	Calcined coke
Moisture	6% - 14%	0.1%
Volatile Matter	8% - 14%	0.5%
Sulfur	1% - 4%	1% - 4%
Silicon	0.02%	0.027%
Iron	0.013%	0.02%
Nickel	0.02%	0.03%
Ash	0.25%	0.4%
Vanadium	0.015%	0.3%
Bulk Density	45 - 50 PCF (720 - 800 kg/m ³)	45 - 50 PCF (720 - 800 kg/m ³)
Real Density		2.06 g/cm ³

*Items not shown



Supporting customers at every part of their journey

Whether you're looking to improve upon a current calcining operation or develop a new calcining system, our engineers are your experts in thermal processing design, support and optimization.

