# CellChem™ Sulphur Furnaces

The CellChem Sulphur Furnaces from NORAM are highly efficient sulphur burner systems occupying relatively small spaces. The furnaces efficiently atomize liquid sulphur to produce high strength sulphur dioxide gas. With over 150 successful installations, the CellChem™ Furnaces have a proven track record of reliability and efficiency.

## CellChem Sulphur Furnaces

NORAM's line of Cellchem sulphur burners serve a variety of industries requiring relatively "small" quantities of sulphur dioxide ($SO_2$). Available standard capacities range from 0.5 to 100 tonne per day (TPD) sulphur burned but have been customized up to 600 TPD. These sulphur burning systems can be tailored to produce a range of downstream products including $SO_2$ gas across the entire concentration range, liquid $SO_2$, sulphite and bisulphite solutions of varying concentration, and $SO_2$-water solutions (sulphurous acid).

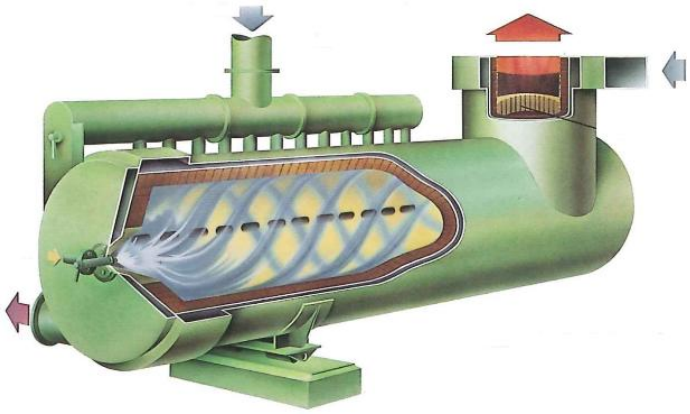

*Figure 1 CellChem Spiral Flame Furnace*

## How it works

The Cellchem burners produce relatively high strength $SO_2$ gas (up to 19% when burned in air) in a compact design. When the technology was introduced in 1960, the burner had less than one third the volume of a conventional burner. This was attained by producing small droplets of sulphur in a custom air atomization sulphur gun and by introducing high velocity combustion air tangential to the combustion chamber, thus giving the flame a spiral path. The units were thus dubbed the spiral flame or 'SF' sulphur burners.

Producing $SO_2$ gas at high strength reduces the size of downstream operations, and results in a minimal amount of sulphur trioxide ($SO_3$) being formed in the furnace. Minimizing $SO_3$ formation reduces corrosion and product quality problems downstream since any $SO_3$ is typically converted to sulphuric acid or sulphate ions in downstream operations.

About 20 years after the development of the SF burner, the cyclone flame or 'CF' burner was developed for the smaller applications, specifically for capacities of 0.5 – 8 TPD sulphur. A further optimization of the flame path resulted in a burner volume of 1/4 the size of the larger SF burner. The small footprint of the CF burners means they can easily be supplied modularized, i.e. skid mounted.

The brick-lined Cellchem burners are designed to achieve a high enough temperature on the uninsulated carbon steel shell to avoid condensation of acid and subsequent corrosion. The temperature of the shell, however, cannot be so high that it compromises the mechanical integrity of the steel. For the CF burner, this is accomplished by natural convective heat losses to the environment; for the SF burner it is accomplished by running an air-cooled jacket around the burner.

## Thermal $NO_X$

The cooling air passing through the cooling-air jacket removes heat from the furnace depending on the amount of cooling air flow. This helps maintain the combustion temperature at a certain level which can be controlled to stay below the threshold at which thermal $NO_X$ forms.

When the furnace operates with a waste heat boiler to produce steam, the heated cooling air can be recirculated as combustion air, effectively utilizing this energy for steam production.

NORAM International AB
Gruvgatan 35A
421 30 Västra Frölunda, Sweden

+46 31 757 40 10

info@noram-intl.com

https://noram-intl.com

## The benefits

- High SO2 gas concentrations, 18-19 %
- No sublimation
- No thermal $NO_X$
- Minimal burner corrosion
- High turndown ratio
- Remote control
- 150+ plants world-wide
- Available in skid mounted units
- Occupies small spaces

## Typical system performance

Raw material consumptions are presented on a per tonne of SO2 produced basis.

| | |
|---|---|
| Sulphur | 0.5 tonne |
| Combustion air | 2000 Nm3 |
| Steam (for sulphur melting) | 0.1 tonne |
| Compressed air | 300 Nm3 |
| Cooling water | 50 m3 |
| Process water | 2 m3 |

*Figure 2 CellChem Cyclone Flame Furnace*

## Downsteam process and products

$SO_2$ gas leaving the furnace holds a temperature of about 1200°C, which almost always requires cooling before send to downstream processes. To utilize the energy produced inside the furnace the gas can pass through a waste heat boiler generating steam. The temperature of the gas cools down to approximately 300°C and enters a quench tower for further cooling. In cases where steam production is not relevant for the client, the gas goes directly to the quench tower for cooling.

Following gas quenching operations, a number of options are available for the SO2 gas: it can be directly conveyed to the end user (e.g. ClO2 generator), absorption into water to produce SO2 water, absorbed into an alkali to produce a sulphite or bisulphite solution, or concentrated to produce high strength SO2 gas. Additionally, NORAM can provide scrubber systems that ensures the remaining gas stream is released into the atmosphere with non-detectable $SO_2$ concentrations

## NORAM End-to-End Process Expertise

At NORAM we are experienced with designing complete systems from sulphur to end product. Our expertise enables us to optimize the process design and mechanical configurations of the process to minimize the risk of corrosion and meet the requirements by the client in an efficient way.


*Figure 3 CellChem Sprial Flame Furnace*

NORAM International AB
Gruvgatan 35A
421 30 Västra Frölunda, Sweden

+46 31 757 40 10

info@noram-intl.com

https://noram-intl.com