



FUELFLEX[®] PYROLYZER

Enabling up to 100% alternative fuels in the calciner

BURN MORE ALTERNATIVE FUELS, MORE EFFICIENTLY

Fossil fuels are expensive and a significant contributor to the cement industry's damaging environmental impact.

We know we need to use less, but so often process issues get in the way of greater fuel substitution. The FUELFLEX® Pyrolyzer addresses those issues, clearing the path for 100% alternative fuel use in the calciner.

The FUELFLEX® Pyrolyzer is a new technology specifically developed for the cement industry to replace all calciner fuel with Refuse Derived Fuel, RDF, and other alternative fuels, ensuring efficient, complete combustion, NOx control and process stability.

The FUELFLEX® Pyrolyzer eliminates the need for a costly calciner extension to be able to reach high degrees of fossil fuel replacement by high-volatile solid fuels, which may have significant moisture content, large particles and varying calorific value. It also improves NOx emission control to the extent that the need for ammonia injection for NOx limit compliance is dramatically reduced.

KEY BENEFITS

**Increase alternative fuels and
reduce fossil fuel use**

**Suitable for most high-volatile fuels,
e.g. RDF and biomass**

Maintains good stability in the kiln

**Lowers NOx (or less emissions
abatement required)**

**Get more value from your
alternative fuels**

PYROLYZING ALTERNATIVE FUELS

The FUELFLEX® Pyrolyzer utilizes hot meal from the lower preheater cyclones (yellow arrows) to dry and pyrolyze RDF or biomass. Either part or the full stream of hot meal from a lower preheater cyclone is admitted to the Pyrolyzer via the U-Lock (controlled by two dividing gates). The U-Lock fluidizes the hot meal, forming a U-shaped gas lock that prevents pyrolysis gases from flowing backwards through the process. Subsequently the hot meal stream flows into the Pyrolyzer vessel, which also has a U-shaped lower aerated section to contain the hot fluidized meal. Fuel is pneumatically fed to the pyrolyzer vessel where, through contact with the hot meal, it is dried, heated and pyrolyzed to form reactive gases and char. The gases push upwards into the main pyrolyzer vessels while the char falls down into the fluidized meal bed, before being reunited and fed as a very reactive stream into the calciner.

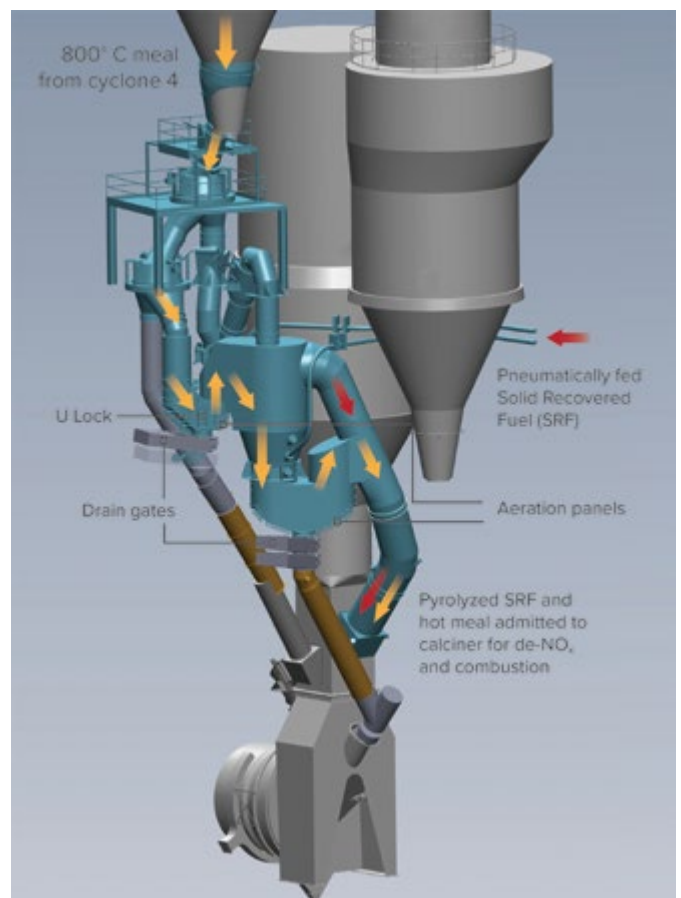
Aeration panels are used to fluidize the hot meal and drain gates are used to drain out debris and meal from the pyrolyzer to the kiln system in a controlled manner.

The reactive stream of pyrolysis products reacts with rotary kiln NO by so-called “re-burning” reactions, utilizing pyrolysis gases to convert NO into free N₂ in the reduction zone prior to mixing with preheated combustion air in the calciner. In addition, the full fuel pyrolysis preceding the calciner helps limit calciner NO_x formation by limiting access to oxygen when burning.

Reduced fossil fuel use

By using the FUELFLEX® Pyrolyzer, cement plants can achieve up to 100% fossil fuel replacement in the calciner, with the following benefits:

- Reduced CO₂ emissions, as net CO₂ emissions from alternative fuels generally are lower than from fossil fuels
- Increased utilisation of local waste streams, avoiding the need to dispose or store this waste in other ways.
- Reduced fuel costs, especially in times of fluctuating energy prices.
- Reduced fossil fuel use saves the associated environmental impact of fossil fuel extraction and transport.



Re-burning reactions utilizing SRF pyrolysis gases to convert NO into free N₂ in the reduction zone prior to mixing with preheated combustion air in the calciner.

Controlling NOx

The expense of controlling NOx emissions can add up to hundreds of thousands of euros per year. By successfully limiting NOx emissions, the FUELFLEX® Pyrolyzer enables cement producers to dramatically reduce ammonia water consumption, and the cost, environmental, and health and safety impacts associated with its use. It's also much easier to meet NOx compliance limits, due to the lower baseline NOx in the process.

Compact footprint

The FUELFLEX® Pyrolyzer requires no increase in the cement process installation footprint or height, as the installation is fully integrated into the existing process structures. It can be retrofitted to most types of calciners if the preheater layout allows sufficient space and height.

New energy efficient fluidization

We developed a patented aeration technique that uses little pulses of air to enable hot meal to flow smoothly without blockages.

The pulsed aeration technology is quite different from conventional fluidization in that the fluidization air consumption is dramatically lower and the meal bed is made up of fine cohesive powder (raw meal). This detail makes the FUELFLEX® Pyrolyzer very energy efficient – and avoids unnecessary production capacity loss of the kiln system.

What is pyrolysis?

Material is exposed to high temperature and, in the absence of oxygen, goes through chemical and physical separation into different molecules.

Pyrolysis is one of the sustainable solutions that are economically profitable on very large scales and can minimize environmental problems, especially in terms of waste minimization.

Minimising coal use

Where plants want to reduce coal and petcoke use to the absolute minimum, but still have coal or petcoke on standby when they need it, we have developed the Pfister® FEEDflex, an upgrade to the Pfister® DRW Rotor Weighfeeder that enables pulverized fuel dosing to be reduced to just 60 kg/h without impacting the maximum feed rate. This is not included with the FUELFLEX® as standard but may prove a useful addition.

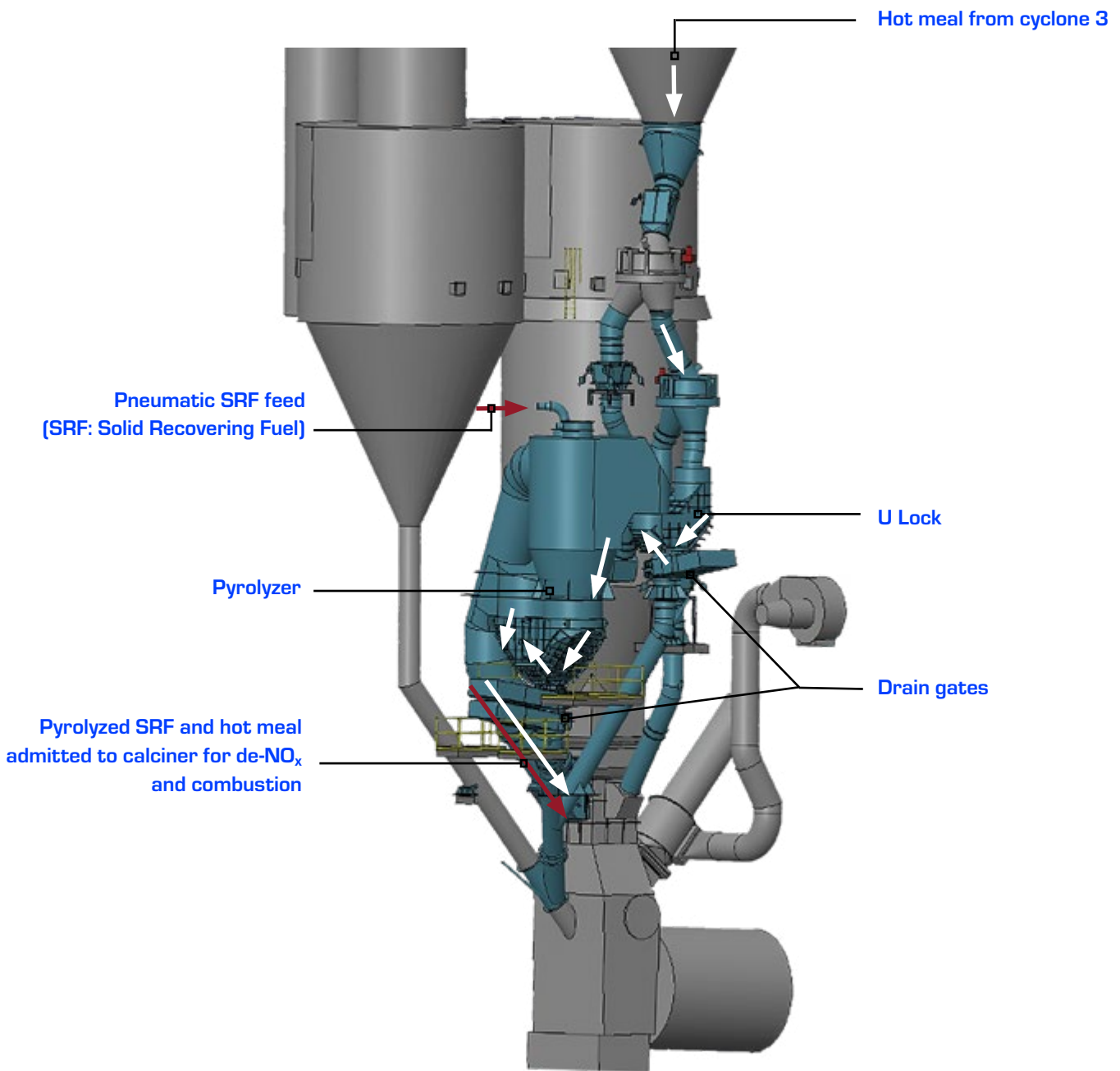




What FLSmidth has done with this new system is basically reorganise the calciner to achieve a more efficient, lower NOx combustion process. With coal prices rising exponentially, the cost saving alone would be enough to justify the project. But what we're really chasing is a lower carbon end-product – that's what our customers want, and it's what we want, too. The success of the FUELFLEX® technology is a big win for us, as we are now on track to eliminate all coal use in the clinker production phase by early next year, which surpasses our initial expectations of displacing 80%. This will remove around 40,000 tonnes of coal, and the resulting net 58,000 tonnes of carbon emissions per year, so it's a significant leap forward in our decarbonisation journey."

- KEVIN LUNNEY,
CHIEF OPERATIONS OFFICER FOR MANNOK





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