

MATRIX PDM ENGINEERING

Sulphur forming for a global market

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As world markets continue to reel from supply chain issues first triggered by Covid-19, the impacts on both producers and consumers of sulphur – a vital raw material used in the creation of sulphuric acid and the subsequent production of fertilizers – have been no exception.

For fertilizer manufacturers, the price of molten sulphur is up more than 400 per cent compared to a year ago, while transportation and other operating costs are also on the rise as diesel and other utility prices increase. Now, geopolitical events also threaten further supply chain disruption and increases in material costs. These include the worldwide sanctions placed on Russia (the largest global exporter of fertilizer) in response to its invasion of Ukraine, and China's recent lockdowns in Shanghai and Beijing.

In this environment, producers and consumers are looking for ways to:

- Lower capital outlay and operating costs
- Ensure sufficient product moisture to minimize the dangers associated with dust formation
- Minimise logistical issues associated with long-distance shipment
- Maximise longer-term storage.

The method chosen for sulphur forming, a process used to solidify molten sulphur, is critical when it comes to achieving these objectives.

Exploring the options.

Technologies available for sulphur forming include granulation, pastillation, and wet prilling.

- **Granulation** is a process where molten sulphur is sprayed onto a seed curtain within a rotating drum and water is then sprayed into the drum to cool the sulphur, forming sulphur granules.
- **Pastillation** occurs when water is sprayed under a steel belt onto which liquid sulphur drops have been deposited, producing pastilles or small lozenge-shaped sulphur pills. During pastillation, water and sulphur do not come into direct contact during the forming process.



Above: Two Devco II wet prilling units, central China. These 8,600 t/d capacity units have a space-efficient, modular design.

Below: The formed sulphur prills from the Devco II system after screening.



- **Wet prilling** is the other option. It is provided through modern technology like the Devco II system, a proprietary prilling technology offered by Matrix PDM Engineering. In wet prilling, molten sulphur travels through a counter-current forming tank where it is exchanged with water to produce uniformly sized prills. These are withdrawn from the bottom of the forming tank after which the correct amount of water is removed on dewatering screens.

As forming methods, granulation and pastillation both require the addition of proper dust control during handling and transportation

due to their similar environmental and safety risks. Both methods often require sulphur preconditioning too. This is to ensure that sulphur is maintained at an optimal temperature and any H₂S generated – a highly toxic gas found in molten sulphur – is kept to safe, minimal levels.

Wet prilling offers maximum flexibility in moisture control. In our view, it is the only forming technology that properly maintains sulphur moisture content for global market transportation by meeting or exceeding international requirements set by global sulphur importers. The ability to optimise moisture content has also been proven for long-term storage under extreme environmental conditions (hot arid, hot humid, extremely cold) without the need for additional dust control or specialised loading equipment.

Advantageously, the technology used for wet prilling:

- Is modular in design and construction, resulting in **lower capital outlay**. Among its major components are the forming tray(s), forming tank, dewatering screen(s), fume hood, process water cooling system and atmospheric fume scrubber (when required). No intermedi-

ate molten storage, pumping or pre-conditioning is required between the sulphur recovery unit (SRU) and prilling system.

- Has **lower operating costs** – critically important in the current environment, especially in energy-intensive industries such as fertilizer production. These reduced operating costs are achieved through minimal power consumption, a gravity-driven process flow, minimal moving parts, elimination of the need for dust suppressants, and fast start-up/shut down.
- Offers flexibility in processing capacity while also offering a **substantially higher maximum single-unit capacity with a significantly smaller footprint**. For example, a single Matrix system has a capacity of 2,000-2,250 tons per day (t/d) compared to a single granulation unit which has a capacity of approximately 500-1,000 t/d and a typical pastillation unit with a capacity of 120-275 t/d. The Matrix system's footprint is just 10 metres by 8.5 metres, small compared to similar capacity systems for granulation (38 m x 22 m) or pastillation (28 m x 26.5 m).

The Devco II wet prilling system

The Devco II system, the modern proprietary wet prilling technology offered by Matrix PDM Engineering, is notable for combining high production capacity with low capital outlay and operating costs. This system is currently installed in more than 18 countries and on nearly every continent, with proven operational success under extreme weather conditions and in highly scrutinised environmentally sensitive areas. Matrix PDM Engineering prides itself on its flexibility in providing custom-based solutions to meet any client need.

Matrix PDM Engineering, the engineering division of Matrix Service Company, provides lifecycle engineering, procurement, and construction (EPC) services across the energy and industrial markets. Matrix PDM possesses more than 40 years of industry-leading expertise across the entire sulphur spectrum, including capabilities for:

- Molten sulphur storage, handling, and loading
- Sulphur forming
- Solid sulphur handling and loading
- Sulphur block pouring
- Sulphur remelting. ■