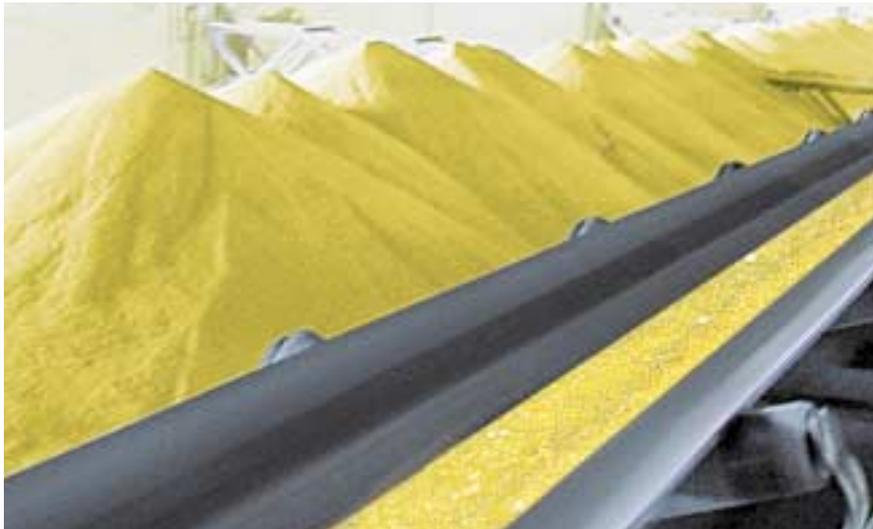


Italian sulphur processor chooses Sandvik Rotoform® for the fifth time



Solidification plants at Econova boosts pastillation capacity to 2280 tons/day

Sandvik's innovative Rotoform® pastillation system, first launched in 1980 and forming the basis of its sulphur granulation systems ever since, has been specified for the fifth time by Italy's largest company in the field of sulphur processing.

There are currently 12 Rotoform 3000® systems and a single Rotoform High Speed line in operation at Econova's Sicily base, providing a total capacity of 1850 tons/day. A further three Rotoform 3000® systems installed at Econova Apulia in early 2008 provide an additional 430 tons/day capacity.

"We have been working in close cooperation with Sandvik since the early 1990s," explains Dr. Massimo Andaloro, technical and plant manager at Econova, "so we know the advantages of this

system. We also provide consultancy and technical advice to other companies around the world so we're fully aware of alternative systems. The decision to remain with Rotoform® was made on the basis of the proven quality of pastilles and reliability of performance."

"Together with Sandvik we have extensive expertise in the Rotoform® system having worked on everything from feasibility studies to turnkey construction and commissioning of sulphur solidification plants," says Dr. Giovanni Balistreri. "Over the next few years, we want to put this knowledge to use in other applications such as the solidification of paraffins, sulphur bentonite and other chemical products."

Esso investment and Sandvik technical expertise

Econova entered the business of sulphur solidification in 1990 following the collapse of another company that had previously taken Southern Italy's sulphur output for processing into sulphuric acid.

This lack of a convenient market for the increasing levels of sulphur produced at its oil refineries led Esso to investigate a number of different solutions in use around the world.



Liquid sulphur supply at Econova



Feeding side of Sandvik Rotoform® units



Rotoform® sulphur feeding



Sandvik Rotoform® cooler-discharge



Sandvik Rotoform® units – discharge and conveying of sulphur pastilles

The processing of crude oil into fuel requires the extraction of as much sulphur as possible and the most advanced process is the Claus process, which converts H_2S into elemental sulphur.

While the previous processing company specifically required liquid sulphur for the production of sulphuric acid, Esso's feasibility project recognised that greater demand – and hence higher prices – existed for sulphur in a form that could easily be transported for subsequent reprocessing. Liquid sulphur is costly to move and store and, at temperatures of up to $145\text{ }^{\circ}\text{C}$, also requires strict safety procedures. With markets throughout the Mediterranean region requiring sulphur as a raw material for fabrics, agriculture and rubber vulcanisation, the sulphur clearly had to be processed into a more easily manageable form.

Having decided that solidification was the most appropriate way forward, Esso then looked at the alternatives in this market. Their findings favoured Sandvik's Rotoform[®] solidification technology, the necessary investment was committed and, as Esso wanted to maintain focus on core operations, Econova was born.



By 1992, the first complete turnkey installation had been put in operation at Melilli, near Syracuse. This system, consisting of sulphur pit, preconditioner, four steel belt coolers with Rotoformers[®] and the cooling water tower, was designed for 24 hour a day operation, 365 days a year, and has been processing up to 300 tons a day ever since.



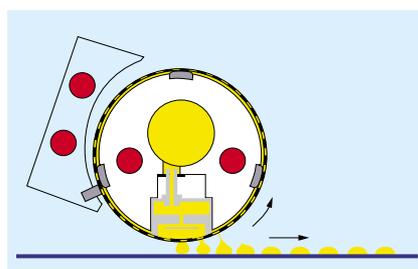
However, growth in demand from other companies in the Mediterranean region – including Exxon Mobil Chemical, Agip Petroli and ISAB Energy – meant that this 300 tons/day capacity would soon be insufficient so Econova embarked on an on-going programme of investment.

The Sandvik Rotoform[®] system



The basic pastillation principle consists of a Sandvik Rotoform[®] feeding system which deposits droplets of liquid sulphur onto a continuously running steel belt. Water is sprayed against the underside of the belt and the resulting transfer of heat converts the droplets into solid pastilles.

This process forms molten product directly into granules or pastilles so there's no requirement for grinding or crushing. This eliminates the costs and



environmental problems, such as noise and dust, which are usually associated with these secondary processes. This combination of simplicity, efficiency, product quality and minimal environmental impact is the key to the success of the system and its versatility has resulted in over 1 300 installations across a whole range of applications – since it was first launched.

Looking at the system in more detail, the process starts with the delivery of

sulphur melt by pipeline or in special trucks, and its storage – ready for processing – in heated tanks. Heated pumps then supply the liquid sulphur, at a constant pressure, to the Rotoform[®] units.

The Rotoformer[®] itself consists of a heated, cylindrical stator and a perforated rotating shell that turns concentrically around the stator, depositing sulphur drops across the whole operating width of the steel belt. The circumferential speed of the Rotoformer[®] is synchronised with the speed of the belt, ensuring that drops are deposited accurately, consistently and without deformation.

Heat released during solidification and cooling is transferred by the stainless steel belt to the cooling water. This is sprayed against the belt



Sandvik Rotoform® units at
Econova / Melilli / Sicily

Since that first installation a further eight Rotoform 3000® systems have been installed at the company's Sicily site, and in 2007 a thirteenth line was installed, this time making use of Rotoform HS (high speed) technology. This new system is based on the same principle as the standard Rotoform® but, by making use of a larger head and longer steel belt cooler, delivers twice the previous capacity – up to 12 tons per hour, making it ideal for high capacity sulphur solidification installations. Additional benefits include easier servicing and reduced spares requirement.

This investment has given Econova the capacity to handle up to 1850 tons/day at its main Sicily site. The recent opening of a new plant – based around three Rotoform® lines – at the ENI refinery in Taranto, Italy gives Econova an additional 430 tons/day capacity and boosts total production to 2280 tons/day, 365 days/year.

underside, collected in tanks and returned to the recooling plant. At no stage does the cooling water come into contact with the sulphur. At the cooler end, pastilles are taken off with a discharge knife and pass, via a chute, to a collecting belt for further processing. To eliminate the possibility of damage to the pastilles during discharge, a silicon-based release agent is applied to the steel belt as a thin film by means of a roller system.

An automatic filling system ensures that sufficient quantity of the release agent is always held in the tank.

The Rotoformer® is equipped with an effective exhaust system, with a tight exhaust hood, an air exhaust and throttle flap positioned above each Rotoformer®. The solid pastilles are transferred to the storage silos via belt conveyors or a bucket elevator.

Commercial, practical and environmental benefits

The most obvious benefit of efficient pastillation is the production of a consistently high quality end product, meeting all relevant international standards.

Considering the fact that solidified sulphur may be moved as many as 15 times between production and re-use (i.e. the various stages of handling, transport, storage, etc.), there are a number of prerequisites of a premium pastille:

- Low friability and impact abrasion resistance (low visual dust generation)
- Good flow characteristics, but high angle of repose
- Uniform size and therefore good characteristics for blending
- Low moisture content
- Stable properties over time
- Consistent quality

With indirect but highly efficient heat transfer, clearly defined cooling times and controllable quality through accurate crystallisation, the Rotoform® system satisfies all necessary technical requirements and the consistent, hemispherical shape of the pastilles themselves ensures excellent handling and storage characteristics.

In short, the Sandvik Rotoform® lines here at Econova deliver all the requirements of this product form: easy product flow and high bulk weight through a pastille that's uniform, stable, thermally unstressed and of high purity and quality.

While this in itself is a key advantage of the system, Sandvik's Rotoform® also provides three other major benefits for Econova: easy operation and maintenance, minimal environmental impact and maximum versatility.

Maximum up-time

As mentioned above, Econova's Rotoform® lines have been designed to operate with minimum operator intervention for optimum productivity and lower employee costs. In the event of planned or unscheduled maintenance

requirements, the systems can be shut down quickly and easily. All essential components can be accessed from the shopfloor without auxiliary equipment and, with few moving parts to maintain, operations can be restarted with the minimum of downtime.

Environmental aspects

Concerns over environmental issues are receiving increasing attention, not only from governmental and other regulatory bodies, but also from environmentally aware organisations such as Econova themselves, and this was an important factor in choosing this particular solution.

"Of all the processes available on the market," says Dr. Giovanni Balistreri, shareholder and managing director of Econova, "the Rotoform® pastillation process has proven to be one of the most environmentally-friendly."

With Sandvik's continuously operating steel belt coolers, heat is transferred indirectly. So neither the sulphur nor the cooling water can be contaminated, and the water is normally just recycled back into the system after cooling. Within the plant itself, the low friability of the pastilles means the atmosphere is virtually dust free and the extracted fumes meet all legal requirements without need for treatment such as scrubbing or incineration.

Coping with varying throughput requirements

Sulphur supply is subject to very high fluctuations caused by variations in sulphur content of the crude oil and by the mode of operation, so the Rotoform® system has been designed to enable rapid changeover to partial operation without any loss of quality. Alternatively, as Econova's overall site consists of several Rotoform® lines, entire lines can be shut-off and re-started at short notice, adjusting overall plant throughput for maximum flexibility.



Looking beyond sulphur

The experience gained over the last 10-12 years has enabled Econova to establish itself not only as Italy's No.1 company in sulphur solidification, but also as a major supplier of consultancy, design and installation services to other companies. This involves a great deal of research, development and system testing – carried out in partnership with Sandvik – and the company now sees major opportunities for growth through diversification into other solidification applications.

Together, Sandvik and Econova expect their close co-operation to pay real dividends over the coming years as they continue to work together to improve the efficiency and productivity of solidification plants at Melilli/Sicily, Taranto/Italy and further afield too.



Econova management: (left to right) Dr. Massimo Andalaro, Dr. Giovanni Balistreri, Dr. Piero Balistreri. Sandvik: Romolo Colli, Sales Engineer SPS Italy



Conveying of sulphur pastilles



Rotoform® sulphur pastilles on the way to stockpile



Econova's purpose-designed unit for depositing pastilles on the stockpile



Econova stockpile



Ship loading at the harbour, Augusta/Sicily



ISO 9001 : 2000



ISO 14001 : 2004
OHSAS 18001 : 1999



www.econovasrl.it



www.processsystems.sandvik.com