Sandvik capabilities in the petrochemical industry
Sandvik steel belts around the world

Sandvik steel belt technology forms the basis for all of our processing systems and delivers a range of proven benefits.

- Hard and smooth surface
- Temperature resistant
- Corrosion resistant
- Easy to clean
- Endless weldable
- Wear resistant
- High thermal conductivity
- High tensile stress resistance
- Easy to repair

A number of Sandvik standard steel belts are available for chemical processing applications, and we can incorporate a full range of special designs to satisfy particular requirements.

- Various grades of stainless or carbon steel.
- Various thicknesses and widths.
- Side retainer and retaining strips.
- Various surface finishes from cold rolled to mirror polished.
- Steel belt technology has proved a highly efficient and economical solution for the petrochemical and fertilizer industries.
**Economical processes for the petrochemical and fertilizer industries**

We offer a choice of solidification systems based on the proven performance of steel belt technology.

**Granulation process (flaking and pastillation)**
- Sandvik Rotoform® process – for high quality free flowing pastilles.
- Sandvik flaking process – ideal and economical solution for high capacity requirement of bulk products.

**Our solidification processes are developed for products like:**
- Sulphur / sulphur bentonite
- Paraffin wax
- Pitch
- Asphaltene
- Bitumen

**The advantages at a glance:**
- Efficient cooling through good contact with the steel belt.
- Very wide product viscosity range.
- Very wide temperature range (feeding temperature up to 320°C).
- Easy processing of corrosive, abrasive and sedimenting melts.
- Environmentally friendly production – virtually no exhaust air pollution; cooling water is recirculated.
- Smooth surface of the steel belt means easy maintenance and cleaning.
- System versatility – easy changeover to different products within minutes.

**Sheet casting process**
- for the production of oxidized bitumen in sheets/blocks

Oxidized bitumen: from liquid to solid – on ready-to-load pallets – in less than 15 minutes
The Sandvik Rotoform process combines the Rotoformer drop depositor with a steel belt cooler to create a pastillation system capable of delivering pastilles of highly uniform shape, stability and quality. The process itself is environmentally friendly and can be adapted to meet low or high capacity requirements.

• Pastilles are solidified directly from the melt, eliminating the energy and equipment costs associated with subsequent grinding, crushing or other breaking processes.
• Pastilles are of a highly uniform shape and stability, with practically no dust produced.
• Pastilles are free flowing and ideal for handling, blending, storage and further processing.
• Higher bulk density and better packing properties than bulky flakes.
• Environmentally friendly production as cooling media (water) and product are kept apart, ensuring no possibility of contamination either way.
• The excellent thermal conductivity of the steel belt means cooling time is short, so very little vapor or gas can get into the atmosphere and little oxygen can penetrate the product.

We have developed an entire family of Rotoform systems, each designed for specific applications or process requirements:
• High capacity production
• Corrosive products
• Melts which feed in at high temperature
• Abrasive and sedimenting melts
• Subcooling melts
• Production of micropastilles (down to 1 mm dia.)

Typical Rotoform plant

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• High capacity production
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• Melts which feed in at high temperature
• Abrasive and sedimenting melts
• Subcooling melts
• Production of micropastilles (down to 1 mm dia.)
The flaking process is specially developed for high capacity production of bulk material.

This proven solidification system consists of an overflow weir feeder and a steel belt cooler. The heated weir distributes the product over the steel belt and forms a film that is taken up by the running steel belt.

The liquid product solidifies to an even layer on the steel belt, which is cooled by spraying water from the underside. Retaining strips of Neoprene or rubber prevent the product from spilling over the edges of the steel belt.

At the cooler end, a crusher breaks the solid product layer into small irregular flakes. After leaving the crusher, the flakes are fed into a chute for further processing.

Sandvik flaking system
The Rotoform process for

Typical data for the Rotoform process

<table>
<thead>
<tr>
<th>Product</th>
<th>Pastille shape</th>
<th>hemispherical, uniform</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pastille size</td>
<td>2-4 mm</td>
</tr>
<tr>
<td></td>
<td>Bulk density</td>
<td>&gt;1,150 kg/m³ loose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;1,320 kg/m³ packed</td>
</tr>
<tr>
<td></td>
<td>Dust (&lt;0.3 mm) as produced</td>
<td>&lt;0.2%</td>
</tr>
<tr>
<td></td>
<td>Friability stress level II (acc. to SUDIC)</td>
<td>&lt;2%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit</th>
<th>Capacity</th>
<th>max 6 t/h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Capacity range</td>
<td>70-100%</td>
</tr>
<tr>
<td></td>
<td>Belt area</td>
<td>7.5 m x 1.5 m</td>
</tr>
<tr>
<td></td>
<td>Floorspace requirement</td>
<td>approx. 11.0 m x 2.0 m</td>
</tr>
</tbody>
</table>

Formed sulphur

- Free flowing pastilles of uniform size and quality. Ideal for subsequent handling, storage and transport.
- Premium spec. quality according to SUDIC (Sulphur Development Institute of Canada) test.

Process

- Indirect heat transfer – no contact between product and cooling medium.
- Controlled crystallisation – well defined cooling time.
- Environmentally friendly – emissions within the limits of international laws; recycling of cooling water.
- Flexibility – rapid changeover to partial operation without affecting quality.
- Quick start-up and shut-down of plant.

Equipment

- Ability to increase capacity by grouping several identical units.
- Suitable for remote areas and harsh weather conditions (hot or cold).
- Continual process development and improvement.
- Customer support and back-up through test and pilot plants.
- Worldwide service network available at short notice.

This unique combination of benefits has resulted in more than 250 Rotoform units being built for the pastillation of sulphur.
Recent years have seen us establish ourselves as a reliable partner to a growing number of internationally-renowned engineering companies that serve the petrochemical industry, and Sandvik sulphur pastillation units are now operational on all five continents.

Our activities range from cooperation during FEED (front-end engineering design) to EPC (engineering procurement construction) contracts, and turnkey solutions include liquid sulphur supply, solidification and downstream handling of solid sulphur as well as utility equipment and control systems.
The mixture of sulphur and bentonite (a special form of clay) makes sulphur suitable for use as a low cost and efficient fertilizer. We have developed a process for mixing these two products and forming the resulting sulphur bentonite into free flowing pastilles.

The heart of this system is the Rotoform AS, specifically developed to enable the pastillation of mixtures of melts and abrasive materials.

The end product has a very low dust content and this, together with other key properties, ensures that Rotoform-produced sulphur bentonite complies with the highest environmental standards.

Our expertise in this process enables us to provide complete installations, covering everything from the receipt of base materials right through to weighing and bagging of the final product.

**Rotoform plant for sulphur bentonite**

![Diagram of Rotoform plant for sulphur bentonite](image)
Paraffin wax is a common by-product when oil is refined into lubrication oil and, like other refinery by-products, is usually converted into a solid form for easier handling, transport and storage.

In the past, the traditional method of solidification was to form this wax into 2.5 or 5 kg slabs. However, the development of an efficient pastillation process delivered such a range of benefits that many slab production plants have now been replaced by Rotoform pastillation systems.

The advantages provided by the Rotoform pastillation process include:

- Free flowing pastilles for better handling, storage and metering when blended with other products.
- Low energy costs due to the large heat exchange surface of the steel belt (liquid to solid in less than a minute).
- Rapid rate of cooling enables ‘modified’ waxes (i.e. suspensions or mixtures of waxes of different gravities or viscosities) to be solidified without first needing to be separated.
- High degree of automation means that a plant of five Rotoform units producing 10 t/h, complete with downstream bagging equipment, can be managed by a single operator.
Pastillation of pitch and hard bitumen

The high feeding temperatures of pitch and hard bitumen — as high as 320°C — has until recently prevented the economically viable pastillation of these products.

However, with the development of a purpose-designed system, the Rotoform HT (High Temperature), both pitch and hard bitumen can now be solidified in an efficient and cost effective manner. Pastillation is performed on a continuously running steel belt and delivers consistently sized, hemispherical pastilles without any deformations, fails or strings.

Our expertise goes far beyond the Rotoform pastillator and steel belt cooler that are at the heart of this process; we can engineer, supply, erect and commission the entire system, starting from receipt of the liquid material through to weighing and loading — onto truck, rail or ship — of the bagged or bulk product.
**Different products from A-Z**

**Products most commonly handled using our process systems**

**Additives**  
- Alkane sulphonate  
- Aluminium sulphate  
- Ammonium nitrate  
- Antioxidants  
- Antiozonants  
- Anthracene  
- Asphalt  
- Benzene  
- Bisphenol A  
- Bis-hydroxyethylterephthalate (BHET)  
- Bitumen  
- Calcium chloride  
- Calcium nitrate  
- Calcium stearate  
- Carbazol  
- Catalysts  
- Cleaning agent  
- Cobalt naphthenate  
- Cobalt stearate  
- Crotonic acid  
- Detergents  
- Diaminodiphenylmethane (DMA)  
- Emulsifier  
- Fat chemicals  
  - Fatty acid  
  - Fatty alcohol  
  - Fatty amide  
  - Fatty ester  
  - Fatty stearate  
- Food products  
  - Cacao mass  
  - Cheese  
  - Chocolate  
  - Edible fats  
  - Gelatine  
  - Gum base  
  - Sauces  
- Fungicides  
- Heat melts  
- Based on ethylene vinylacetate, polyurethane, polyamide, polyester  
- Reactive hot melt  
- Insecticides  
- Lactam 12  
- Magnesium chloride  
- Magnesium nitrate  
- Maleic anhydride  
- Master batch  
- Monochloracetic acid  
- Naphthalene  
- Neopentyl glycol (NPG)  
- Nickel catalyst  
- Parachlorobenzol  
- Pesticides  
- Photo gelatine  
- Phthalic acid  
- Pitch  
- Polyethylene glycol  
- Polyethylene terephthalate (PET)  
- Polystyrene  
- Polyvinylacetate  
- Potassium hydroxide  
- Potassium nitrate  
- Potassium polyphosphate  
- Powder paints  
- PVC additive  
- PVC stabilizers  
- Resins  
  - Acrylic  
  - Colophonium  
  - Epoxy  
- Surface active  
- Surfactants  
- Synthetic soap  
- Tar pitch  
- Tensides  
- Toluene-disocyanate (TDI)  
- Triazole (BTA, TTA)  
- Trimellitie anhydride (TMA)  
- Triphenyl phosphate (TPP)  
- Urea  
- UV-stabilizers  
- Waxes  
  - Paraffin  
  - AKD  
  - Microcrystalline  
  - PE-wax  
  - PP-wax  
  - Bee-wax  
  - Filled wax  
  - Flavoured wax  
  - Wax colours  
  - Montan wax  
  - Coating wax  
- Zinc nitrate  
- Zinc stearate  

Our extensive experience in the design of melt granulation systems – from flaking, stripforming and cutting to advanced pastillation lines – means we are able to offer proven solutions for a wide range of chemicals, plastics and intermediates.
The Sandvik bitumen asphalt packaging system is a self-contained system that automatically produces regularly sized packs with little operator attention.

Hot fluid asphalt is fed onto the Sandvik steel belt cooler. Chilled water is sprayed on the underside of the belt, and air is blown from above. The smooth, durable surface of the Sandvik steel belt provides an ideal surface for the temperatures and loadings involved. At the end of the belt the solidified asphalt bands are cut into consistently sized slabs which are stacked to form blocks. These in turn are automatically shrink-wrapped in polyethylene foil, and transferred to pallets. The whole process takes just over 15 minutes, and the packed end product is easily handled, and can be thrown straight into melting vessels on site. Standard pack sizes are 710 x 345 x 100 mm, weighing 25 kg, but this can be adapted to individual needs.
The Sandvik bitumen-asphalt packaging line provides rapid, environmentally friendly production, plus a number of other important user benefits.

- Continuous automatic operation means low labour costs. A plant producing 10,000 tonnes per year can be operated by 2 workers.
- High output of the system, thanks to total time from liquid asphalt to palletized packages of little over 15 minutes.
- Low costs also result from the polyethylene packaging – far cheaper than alternative materials.
- Easy handling is assured by the flexibility to produce packs to specific, consistent sizes. Complete packs can be thrown into melting vessels, without the need to remove the packaging material.
- Regular pack configuration means easy loading and unloading, with packs designed to match standard pallet sizes, and optimum use of storage space.
Based on our experience and steady development we can offer you the latest technology and service for your investment, starting from feasibility studies, test- and pilot production, engineering, manufacturing and supply, erection, commissioning and start-up until handover of a complete plant ready for full production.
for the oil and gas industry
Sandvik – your partner for the petrochemical industry