

## Application

Methylene diisocyanate is used in the production of polyurethane plastics and foams. It is applied over a wide range of products including rigid plastics, paints and adhesives, automotive parts and foams for insulation, bedding and packaging.

The reaction process generates three main isomers; these are 2,4' MDI, 4,4' MDI and 2,6' MDI. The 2,4' MDI and 4,4' MDI are the most commercially important as their ratio in the starting product determines the stiffness of the foam produced when the isocyanate is reacted with a polyol. The monomers also react to form dimers that differ in solubility and produce a cloudy product.

The phase diagram for a solution of 2,4' MDI' and 4,4' MDI' is shown below. The eutectic limits the separation of the isomers. However for MDI this composition is a desirable product for the further production of polyurethane foams.

## Features

### Flexible product purity

Purity >99.5% down to the eutectic as needed.

### Feedstock

Operates on a range of feed stocks with the variations in feed impurity composition being absorbed by the system.

### Economics

Continuous operation and energy efficient suspension based crystallization ensure the operating costs are significantly lower than other separation techniques.

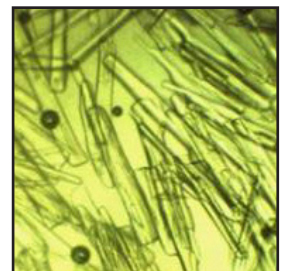
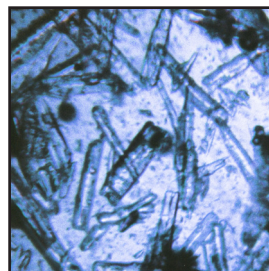
### Maintenance

Low rotating speeds and the robust construction of the GEA Messo PT Purifier provide trouble free operation.

GEA Messo PT can provide assistance in determining the optimum configuration and cost information for your specific circumstances.

# Ultra Purification of 4,4' MDI

## Suspension Crystallization with GEA Messo PT Purifier Separation



## Process Description

The suspension based melt crystallization process is carried out in industrially proven scraped surface crystallizers where the final purification is completed in the GEA Messo PT Purifier. The feed product is cooled inside the crystallizer where part of the product is converted into pure crystal solids leaving the impurities concentrated in the residual mother liquor.

Robust design and practical experience provide for continuous and stable operation of the crystallization process.

The suspension based process provides an enormous number of crystals, some 30 billion individual crystals per  $m^3$  of system volume. As each individual crystal provides growth surface that can absorb the super saturation caused by cooling the product at the swept surface. With billions of individual crystals present, this will provide near ideal growth conditions and ensure the production of ultra-pure crystals.

The GEA Messo PT Purifier completes the separation of this mixture of pure product crystals and residual mother liquor. The purifier is based on GEA Messo PT's patented wash column technology and is an essential component in this purification process.

The crystal slurry is compressed within the GEA Messo PT Purifier to remove most of the mother liquor and form a packed crystal bed. This bed consists of the pure product crystals surrounded by some residual mother liquor. The new crystals entering the purifier will force the bed toward the scraper assembly at the opposite end. The scraper disintegrates the crystal bed and a circulation pump provides melted product to reslurry the crystals.

The circulation flow carries the crystals to a heat exchanger where e.g. steam or hot refrigerant gas from the refrigerant compressor provides the heat necessary to melt the crystals. The melted product can then be discharged to product storage.

The melted product in the recirculation stream counter currently washes the residual mother liquor from the packed crystal bed as it moves through the purifier. The length of the crystal bed provides an extremely efficient wash zone for removal of any remaining impurities in the mother liquor ensuring ultra-pure product. Unlike other solid/liquid separation devices operating with a much shorter bed depth, the wash liquid forms an internal reflux loop and is therefore recovered as recrystallized product in the melt circuit instead of leaving with the mother liquor.

## Experience

GEA Messo PT is a technology oriented engineering company with over 30 years experience in the design and execution of crystallization plants worldwide. We started by crystallizing water from liquid food products in 1973 and since then have built and installed over 100 purification units around the world including applications for water, PX, PDCB, phosphoric acid and many other classified organic chemicals.

New developments in process technologies pose new challenges every day which require innovative and low-cost solutions. Practical orientation and customer requirement play a vital role in this connection. GEA Messo PT consistently orientates itself towards the needs of the customer. GEA Messo PT has been certified according to DIN ISO 9001 standard since 1996 and since June 2003 the ISO 9001:2000 standards were implemented following an audit by the international bureau Lloyd's Register Quality Assurance.

## Next Steps...

On-site demonstration of this technology is possible in various configurations from 3 kg/h up to 300 kg/h using one of GEA Messo's pilot plants. For more information regarding this technology and your specific configuration requirements please contact us at:

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