The world is hungrier than ever. The fertilizer products your industry produces play a key role in meeting the increasing demand for growing the food needed by an ever expanding world population. Your job is getting bigger. We are committed to helping you master your challenges. MAN Diesel & Turbo specializes in meeting the unique compression needs of ammonia and urea plants.

**We understand your business**
MAN Diesel & Turbo has installed 135 custom turbomachinery trains in 65 ammonia and urea plants worldwide. The solutions we bring to you are the result of a continuous cycle of research, development and optimization over thousands of process compressors and turbine casings delivered worldwide since 1904.

**One source**
When everything has to work flawlessly all the time, there is no room for surprises. The components of our full train solutions are designed to match perfectly, all built to the same exacting standards to guarantee lasting, reliable operation with maximum uptime.

**A machine for every process**
We supply the full-line turbomachinery portfolio you need to produce your product at the lowest possible cost, safely and reliably.
- Single and multi-shaft integrally geared air compressors
- Single and multi-shaft integrally geared natural gas compressors
- Ammonia compressors
- Synthesis gas compressors
- CO₂ compressors
- Steam turbines

**World class service**
You need all of your equipment running at maximum efficiency levels at all times. That is the sole focus of MAN PrimeServ, our service organization. We will be at your side with training, parts and personnel 24/7.
**Ammonia Plant**

- Natural gas
- Process air
- Primary reformer
- Steam
- Reformer gas
- Syngas
- Ammonia synthesis
- Refrigeration cycle
- Ammonia

**Gas treatment:**
- CO conversion
- CO₂ scrubbing
- Methanation

**Urea Plant**

**Typical machinery**

<table>
<thead>
<tr>
<th>Plant</th>
<th>Plant capacities</th>
<th>Train</th>
<th>Compressor type</th>
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<tbody>
<tr>
<td>Ammonia</td>
<td>400–4,000 mtpd</td>
<td>Air</td>
<td>Integrally geared / single shaft</td>
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<tr>
<td></td>
<td></td>
<td>Synthesis gas</td>
<td>Single shaft</td>
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<tr>
<td></td>
<td></td>
<td>Natural gas</td>
<td>Integrally geared / single shaft</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Refrigeration</td>
<td>Single shaft</td>
</tr>
<tr>
<td>Urea</td>
<td>650–5,000 mtpd</td>
<td>Carbon Dioxide (CO₂)</td>
<td>Integrally geared</td>
</tr>
</tbody>
</table>
The air compressor takes atmospheric air and delivers it to the secondary reformer for further gas conversion. MAN Diesel & Turbo has built more than 800 air compressors, thereof ~100 installed in ammonia plants, using different design concepts.

**Typical design**
- LP casing with 4 stages, back-to-back (horizontally split)
- Intermediate gear box
- HP casing with 6 stages, back-to-back (horizontally split)
- Three intercoolers
- Extraction of passivation and instrument air after each stage group possible
- Steam turbine driver at LP compressor
- Gas turbine driver possible
Air Compressor
Multi-shaft integrally geared compressor

Typical design
- Six stages on three pinion shafts
- Four intercoolers
- Direct drive by steam or gas turbine via a fourth pinion shaft or by electric motor via the bull-gear shaft
- No additional gear box
- Process control by speed variation or inlet guide vanes
- High efficiency thanks to optimum speed selection for all stages
- Small foot print
As natural gas is available at different pressures at the various sites of installation, the natural gas compressors can be built with varying numbers of impellers. The compressor can be driven by steam turbine or electric motor.

MAN Diesel & Turbo has built more than 370 natural gas compressors using different design concepts.

**Single-shaft compressor**
- Varying numbers of impellers
- Barrel type casing
- Electric motor or steam turbine as driver
- Tandem dry gas seals
Natural Gas Compressor
Single-lift unit with integrated oil system

Multi-shaft integrally geared compressor
- One to two compressor stages
- Electric motor or steam turbine as driver
- Inlet guide vanes at the first stage
- Single lift unit comprising:
  - Compressor
  - Electric driver
  - Lube oil system
  - Dry gas seal panel
  - Local instrument rack
  - Completely piped and wired up to the junction boxes
The ammonia compressor is part of a refrigeration cycle used for condensing the gaseous ammonia from the synthesis gas. Depending on the number of refrigeration stages, this machine consists of several stage groups and is built with one or two casings. MAN Diesel & Turbo has built 90 ammonia compressors, thereof ~ 80% installed in ammonia plants.

**Typical design**
- One or two casings (horizontally split)
- Up to eight impellers per casing
- Sidestream feeding outside the compressor in the piping system or direct admission
- Dry gas seals
- Electric motor or steam turbine as driver
The synthesis gas compressor rises the pressure up to 140 – 210 bar a and delivers the gas towards the ammonia synthesis reactor. The recycle stage for the the synthesis gas loop is integrated in the HP-casing. MAN Diesel & Turbo has built more than 200 machines for hydrogen services and synthesis gas (methanol).

**Typical design**
- Two vertically split barrel type compressors
- Up to eight impellers per casing
- Integrated recycle stage
- Special designed impellers for syngas compression with respect to high pressures (210 bara and higher) and low volume flow coefficient
- Tandem dry gas seals
- Double-end drive high pressure steam turbine
In urea plants CO₂ (washed out in the ammonia process) is converted with ammonia to produce fertilizer.

**Typical design**

- Eight stages on four pinion shafts
- Direct drive by steam turbine or by electric motor
- Process control by speed variation or inlet guide vanes
- Carbon ring seals
- All materials in contact with CO₂ made of stainless steel – no plating or stainless steel welding
- Five intercoolers
- Superior efficiency in comparison to single shaft compressors thanks to optimum speed selection for all stages
- Compact design with a small footprint
- Long time experience with 100% wet CO₂ (first order in 1992)
- CORA research rig for CO₂ compression (pressures up to 250 bara)
- > 600,000 operating hours

MAN Diesel & Turbo is world leader in integrally geared CO₂ compressors!
Large quantities of heat are released in the process, which is used for the generation of steam. The steam is partly employed in cracking the natural gas and partly expanded in the steam turbines driving the compressors.

MDT has built 360 steam turbines for mechanical drive and thereof 250 machines in the typical sizes for ammonia and urea plants.

MAN Diesel & Turbo uses a modular system and provides:
- Condensing and back-pressure steam turbines
- With and without extraction or admission
- Double-end drive experience up to 85 MW
- Live steam parameters up to 540 °C and 140 bara
- Power up to 160 MW
MAN PrimeServ

Maximizing value and performance

MAN PrimeServ is the service brand of MAN Diesel & Turbo. Through its network of more than 100 service centers worldwide, MAN PrimeServ offers 24/7 service around the globe – always ensuring proximity to its customers.

Its range of services includes extensive support, individual consulting and OEM spare parts as well as maintenance, repairs of machinery and comprehensive service agreements tailored to individual needs. A broad range of retrofits and upgrades ensure state-of-the-art technology for machines already in operation.

By implementing cutting edge digital technology, MAN PrimeServ enables customers to optimize their equipment’s performance and maximize availability and uses remote connections to analyze live data and provide quick solutions.

Customers receive extensive training in MAN PrimeServ academies around the world.