The MVR Turbo Fan
The next generation of technology
With the development of the first centrifugal fan by Benno Schilde in 1878, nobody thought that 140 years later TLT-Turbo would become one of the world’s leading manufacturers of axial and centrifugal fans.

Ever since, TLT-Turbo has delivered and installed more than 6000 custom-designed reliable fans around the world.

TLT-Turbo GmbH is present in more than 40 countries all over the world. The resulting closeness to its customers is of significant importance to TLT-Turbo in the global marketplace.

Through the continuous dialog with its customers TLT-Turbo succeeded in developing exactly those products that will be needed by them. Also TLT-Turbo’s engineers and technicians have demonstrated continuous innovative capacity.

It is TLT-Turbo’s internal demand to be the market leader by setting standards with its innovations. And this is exactly the goal we are pursuing with our new fan for mechanical vapor recompression.

The evaporation and distillation of fluids in industries is an established process for the production and preparation of different products and substances. But this method is very energy intensive, because heating steam is needed for the operation of an evaporation system. This heating steam will be transported unused from the condensers after the process of evaporation to the environments.

The most effective possibility to use vapor and to reduce costs is the use of mechanical vapor recompression (MVR). Here, the heating steam will be compressed with the help of a MVR fan. Through the raise of temperature the heating steam will be made useful for the evaporation. This leads to a closed circuit. As long as there is no interruption, no live steam has to be supplied. Only the electric energy to run the fan has to be applied. This energy requirement is considerably under the energy requirement of the live steam production.

We reduce your operating costs.

TLT-Turbo check of facts

- More than 140 years of expertise in construction of fans
- Present in 8 countries with own business locations and with 50 representatives across 40 countries
- More than 6000 installed fans worldwide
- Locations for manufacturing and development in Germany, USA, China and South Africa
- Test stands in Germany, China and USA
- Use of the latest design tools like FEH and CFD

Innovations of TLT-Turbo GmbH

- 1873 First centrifugal flow fan for mine ventilation
- 1950 First axial flow fan with blade adjustment for mine ventilation
- 1985 First fan for "wet" flue gas desulfurization
- 1997 First wind tunnel fan with CFRP-impeller
- 2007 Centrifugal fan with an impeller diameter of 5.3 m
- 2011 Fan for quietest aero-acoustic wind tunnel
- 2015 Centrifugal fan with 12.3 MW required power
- 2016 First MVR Turbo Fan with ceramic hybrid bearing

Fields of application for MVR Turbo Fan.

- Milk production
- Starch
- Fruit juice
- Sugar
- Extracts
- Alcohol
- Yeast
- Bases
- Ascorbic and citric acid
- Phosphoric and nitric acid
- Wastewater treatment
- Seawater desalination
- Salt solution
- Blood plasma
- And many more...
No, they didn’t.

But TLT-Turbo engineers have analyzed existing concepts and made, through extensive dialogue with its customers, necessary improvements. The result of this efforts is a new, innovative product, relevant for the improvement of the operational safety and the reduction of operation costs. The MVR Turbo Fan.

Construction of the MVR Turbo Fan.

- Housing of stainless steel with access port for maintenance and cleaning work
- Water injection for steam saturation and impeller cleaning
- Labyrinth shaft sealing with carbon rings, grease trap and sealing gas connection
- Separated sealing case for easy maintenance
- Completion according to customer application
- Suitable for over and under pressure
- Different types of impellers for multiple applications and big output range
- Constructed for high peripheral speed and high efficiencies
The operating conditions of high pressure MVR fans require tailor-made solutions regarding the impeller design. Due to the speed-controlled operation and the high rotational speeds the rotor dynamics have a high relevance.

The requirement to operate the fan in a broad operational speed range without running into harmful resonance frequencies (under critical operation) leads to the result that conventional roller bearings are not fully appropriate to fulfill this task.

In order to facilitate the high required bearing stiffness, comparatively large diameter bearings are needed. On the other hand these large diameter bearings are not fully suited for high impeller speeds. In addition, oversized bearings have the problem that they may not properly roll in the roller bearing races due to the low and insufficient specific loads, especially at quick speed changes. In this case it leads to unwanted slip in the bearing which will reduce the lifetime of the bearing.

Already many years ago roller bearing systems with an additional external damping (so-called squeeze oil dampers) have been developed in order to solve this issue. In this case an oil-filled annular gap is placed between the roller bearing and the casing. Due to this oil dampening the resonance frequency amplitudes will be maintained at a lower level while passing through the critical speed. In that way also natural frequencies are acceptable under certain circumstances and within a defined speed range. The disadvantage of such a system is the extensive bearing design and the need of an additional external oil supply for the damper.

The TLT-Turbo Innovation.

Due to a continuous enhancement process in recent years, especially by using ceramic materials, more effective roller bearings are available today. Particularly hybrid bearings with steel rings combined with ceramic rollers have been established in many industrial applications such as gas turbines, machine tools, and wind power generators. Hybrid ceramic bearings will be used consistently where classical bearings cause problems or where they work at their limits.

A hybrid bearing at high speed without out circulating oil? Does this work?

The answer is yes!

The most important advantages of hybrid bearings are:

- **Low maintenance costs**
  - Due to low operating temperatures and the advantageous tribological characteristics the hybrid bearings are maintenance free.

- **Insensitive to lubrication deficiency**
  - Hybrid bearings have outstanding emergency running characteristics and are insensitive to lubrication deficiency due to low friction.

- **Higher rotation speed**
  - The maximum impeller speed depends mainly on the thermal condition in the bearing. Hybrid bearings can stand a higher rotation speed due to a lower thermal power loss. Furthermore the TLT-Turbo MVR fan will be operated at under the installed critical speed.

- **Lower operational temperatures**
  - The operational temperature at comparable operational speeds is lower in compared to steel rollers due to a lower friction coefficient of ceramic-steel combinations.

- **Less wearing losses**
  - The rolling friction will be reduced as the centrifugal forces of the lighter ceramic roller are less.

- **Oil-free operation**
  - The bearings are pre-lubricated with grease and no additional oil supply will be used. No risk of contamination of the product due to oil leakages.

The initial situation.

The initial situation.

Low maintenance costs

Insensitive to lubrication deficiency

Higher rotation speed

Lower operational temperatures

Less wearing losses

Oil-free operation
Multi Stage MVR Fans.
Can temperatures from more than 10°C be realized?

Large temperature increases of more than 10°C can be realized without problems by series connection of several fans for mechanical vapor recompression. Also different MVR fans types can be combined in order to achieve the most effective degree of efficiency.

Evaporation process with Multi Stage TLT-Turbo MVR Fans.
MVR Turbo Fan.
Performance Range.

TLT-Turbo is offering a wide range of standardized MVR Fans for different applications and markets. They can be offered as a basic version or as a complete package solutions with motor and frequency converter.