



# APPLICATIONS



**Heavy-duty rollers in the cargo loading system of the world's largest transport plane**

**NOTE**

## Covering the rollers of power drive units so heavy freight can roll easily into the cargo compartment.

Heavy loads, heat, cold and extreme conditions during handling.

### The superlative “freight machine”.

The A300-600ST airbus. At the highest point it measures over 17 m, as high as a 6-story house. The cargo compartment in the main deck is like a warehouse that can fly – over seven meters high, over seven meters wide, and 34 meters long. Its total payload is 47 metric tons. It is designed to transport oversized freight, something which none of the world’s other transport planes can manage.

### Roller conveyor: power drive units and transporting rollers.

A double-tracked roller conveyor has been built into the floor of the main deck to enable loads weighing several tons to be

transported right into the cargo compartment. The track is over four meters wide, and each track contains 166 rollers.

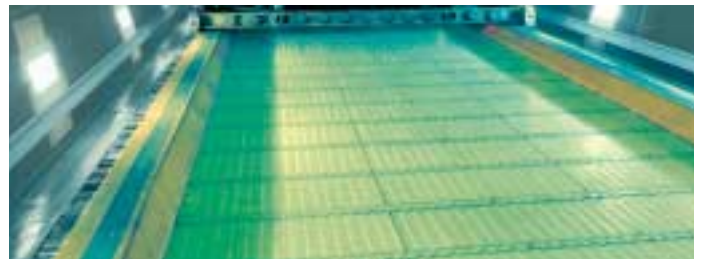
Thirty-four of these rollers are each driven by an electric motor and have a built-in compact planetary gear. These power drive units enable the load to be moved into the cargo compartment. The aim is to optimize the coverings for these rollers – to find an efficient solution.

The other 132 rollers in each track are transport rollers with a metal running surface. The load, driven by the rubber-covered rollers, is pushed via these free-running rollers into the desired position in the cargo compartment.

The A300-600ST Super Transporter, with a payload volume of 1,500 m<sup>3</sup>, has the largest cargo compartment of all planes in service worldwide.



Roller conveyor tracks on both sides of the cargo floor: the optimum covering needs to be found for the 34 power drive units on each side.



Cargo for the biggest transport plane around: it doesn’t just carry the usual containers or pallets. The loads are of quite another dimension. Special transport modules carry cargo such as airplane components (e.g. an Airbus fuselage), enormous tanks, stages of space rockets or entire helicopters right up to the “Beluga”.



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**Its outstanding combination of properties means that Therban® is ideal for use in the cargo loading system of the world's largest transport plane.**

## Success! On a roll with a special high-tech elastomer.

### Top level performance.

The decision after a worldwide bidding process: the rollers for the power drive units in the "Beluga"'s main deck cargo loading system are to be covered with Therban®. The Mitex rubber works (Mitex Gummifabrik Hans Knott GmbH) in Erkrath, near Düsseldorf, won recognition through its know-how in the field of coverings – and with Therban®, the high-performance elastomer that excels among hydrogenated acrylonitrile-butadiene rubbers (HNBR).

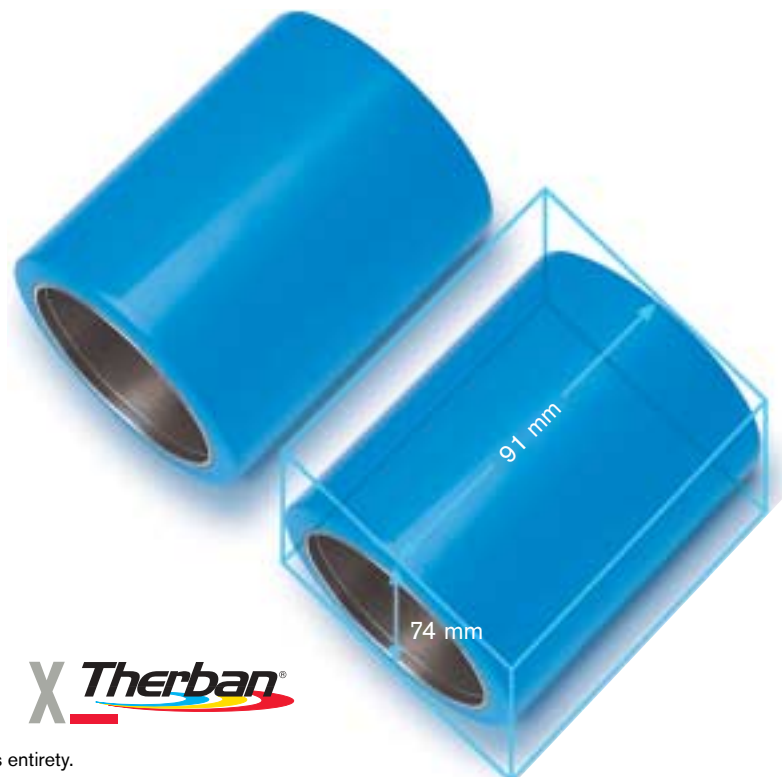
### Tailored to requirements.

Therban®'s property profile can be optimally adjusted to meet specific requirements. Its unique range of properties include thermal stability between  $-40^{\circ}\text{C}$  and  $+165^{\circ}\text{C}$ , resistance to technical fluids and chemicals, dynamic strength, excellent abrasion resistance and dimensional stability. Selective fine-tuning allows exactly the right formulation to be found.

### The winner after millions of tests.

In selection tests specially designed for the purpose, Mitex evaluated a series of elastomers in different formulations that could theoretically be suitable for this special task. The high-performance elastomer, Therban®, was included in the tests.

The results showed that many of the competitive materials were unable to maintain the required surface properties over a long period of time. The outcome of this is less favorable static friction properties. On the other hand, rollers covered with Therban® showed the excellent traction required for controlled movement of the cargo. Concerning the assessment criteria of abrasion resistance and compression set, Therban® was again clearly ahead of the other test candidates.





What used to be a problem has now been solved for good thanks to Mitex's expertise and Therban®: The elastomer adheres securely to the steel driving rollers.

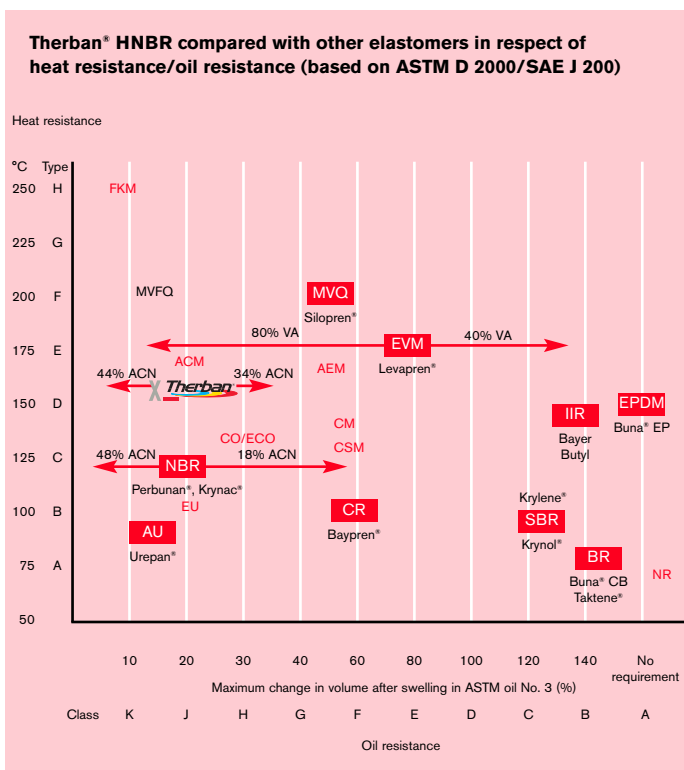


### Perfect adhesion for a perfect material.

One crucial factor for success is the stability of the bond between the elastomer and the special alloy of the steel roller. With Therban®, Mitex can achieve this. The critical point here is the initial movements of the rollers under full load. Although the covering is only a few millimeters thick (necessary for design reasons), the adhesion proves durable. The rubber coating stays in place.

### The more cost-effective the better.

Therban® is a convincing solution. It not only meets the technological requirements but is also cost-effective. Experience from practical tests confirms the benefit that had been predicted, namely that the higher investment costs are compensated by the significantly higher service life. From maintenance and repair to the heavy losses from downtimes and delays, costs are reduced considerably. The Therban® solution quickly pays for itself – after all, only operating time can be billed to the customer. And “just-in-time” supply can only be achieved with reliable machinery.



Therban® HNBR property profile (depending on compound formulation)	
Hardness (Shore A)	40-95
Hardness (Shore D)	up to 70
Tensile strength (MPa)	up to 45
Elongation at break (%)	100-700
Modulus at 100% elongation (MPa)	1-20
Modulus at 300% elongation (MPa)	5-30
Resilience (%):	
RT	30-50
70°C	53-60
Compression set (%):	
70 h/RT	≥ 5
70 h/150°C	≥10
70 h/200°C	≥25
Abrasion (measured according to DIN 53516):	
RT (mm³ loss)	30-80
150°C (mm³ loss)	60-100
Low temperature properties:	
Gehman T10	-31°C
Temperature retraction TR 10	-30°C
Brittle point	<-50°C

Therban® is a registered trademark of Bayer AG

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The only whale that can fly: the giant transport plane, with a maximum operating altitude of 10,700 m, has been given the nickname "Beluga" because of its distinctive front end which resembles a Beluga whale.

## A key element: covering of the rollers.

### Double load.

The rollers of the power drive units have to cope with two severe challenges. First, there is the weight of the load on the roller – a vertical load of up to 1 metric ton on the width of one roller. Second, the roller must also move the freight that is lying on top of it. The unit comprising the electric motor, gears and elastomer-coated steel roller is designed in such a way that it can cope with a traction force of over 3,000 N\* if necessary.

### Wanted: long-lasting solutions.

What's needed is a polymer with a high Shore hardness that can withstand rough contact even with sharp metal edges. Another important requirement is that the driving rollers should function as long as possible. The covering material has to have extremely high abrasion resistance and there should be optimum adhesion between the elastomer and the metal base.

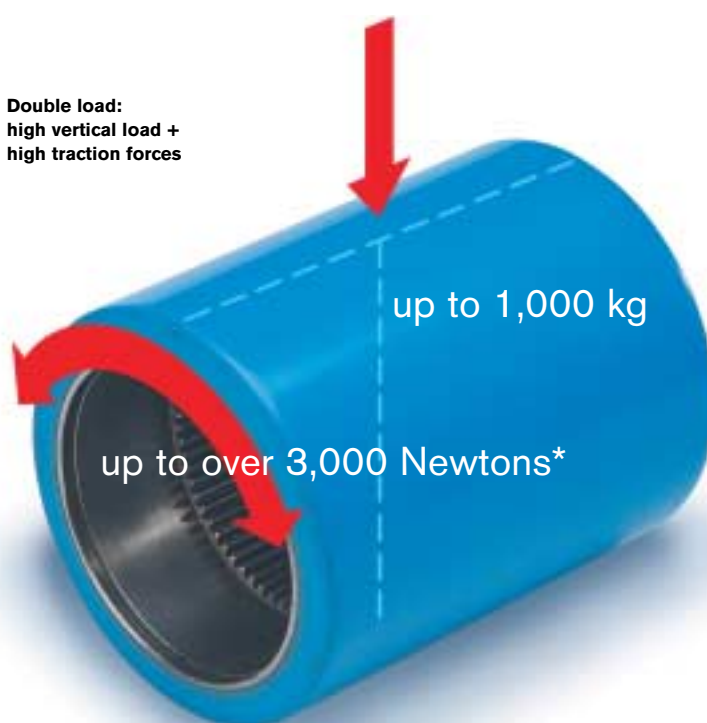
### Large temperature variations within short periods of time.

At a flying altitude of several thousand meters, the cargo compartments, which are not temperature-controlled, are exposed to temperatures at which the moisture in the air will quickly freeze. The roller covering needs to withstand arctic temperatures. On the other hand, when unloading takes place in the hot summer sun, the temperatures may quickly rise to 50 °C or more. What's more, this may happen in the space of a few minutes. These abrupt changes in temperature present a huge challenge to the material. The covering must not become brittle or start to age prematurely. High traction must be provided longterm.

### Long-lasting resistance.

The covering needs to be resistant to the aggressive technical fluids with which it can come into contact on machinery and engines at airports. In particular there is the extremely aggressive, noncombustible hydraulic fluid used in airplanes. The covering materials should be able to offer a high degree of resistance even on contact with aggressive substances like these. In general, the covering ought not to be damaged by oils, lubricants or fuels.

Double load:  
high vertical load +  
high traction forces



\* 3,000 Newtons / tensile stress of 300 kg

## Success through partnership



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Over a period of almost five decades the company has made a name for itself worldwide as a reliable specialist for roll coverings in all sectors of industry. The patented roll covering technology and Mitex's specific chemical know-how are used by licensees all over the world.

LANXESS – a new, globally-active chemicals company with decades of experience. LANXESS is building on the enormous performance potential which helped Bayer set benchmarks in such areas as rubbers and rubber chemicals. As a global player, LANXESS is a reliable partner at the cutting edge of technology.

LANXESS – the name today embodies the commitment to innovation that characterized the inventors of synthetic rubber and the specialists who developed a range of rubber products into today's highly diverse portfolio – a portfolio that extends from commodity products to customized high-tech systems. But LANXESS also stands above all for a new and dynamic commitment. Ensuring that business partners worldwide can achieve sustainable success.

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