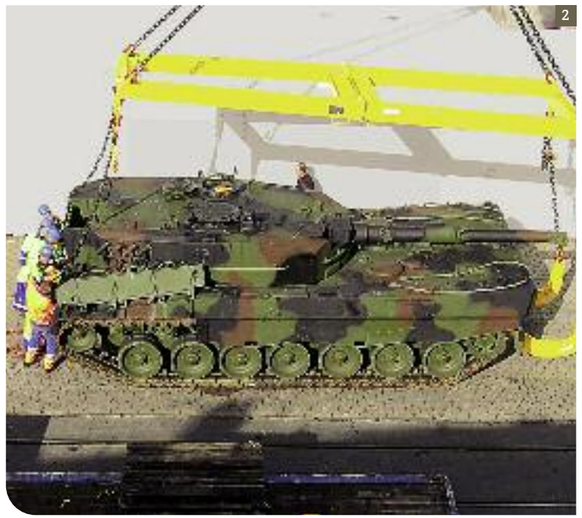
Engine trials in the Chilean Andes

Desert cats

Anyone who has traveled through the high mountains knows the feeling of breathlessness experienced in the thin air. The low oxygen content causes problems not only for humans. Leopard 2 tanks now deployed in the South American Andes have to be adapted to the extreme climatic and air-pressure conditions in the mountains.



1 MTU engineers test the Leopard 2 tanks to the limit in the South American Andes.
2 A harbor derrick lifts the tanks onto a freighter for transportation to Chile.
3 Firmly secured in the hold of the freighter, they set off on their journey.
4 Testing engineers from MTU, employees of Krauss Maffei Wegmann and members of the Chilean military await the Leopards in the Chilean desert.

The Atacama is the driest desert in the world. There are weather stations here that have never registered a single drop of rain in their entire lifetimes.

MEMO

Surviving at over 6,000 m above sea level

The Atacama desert in northern Chile is the driest desert in the world and among the most impressive landscapes in South America. Enormous salt lakes, vast lava fields, huge snow-covered volcanoes and simmering geysers make this landscape an unique natural arena and one of the most inhospitable places on Earth. The main problem for the inhabitants is not so much the lack of rain (it only falls every six to ten years) as the extremely thin air of the Chilean Andes. The low air density makes every physical exertion a trial. But it's not only the people and the herds of llama trundling by as if in slow motion who struggle with the conditions. The functioning of machinery is seemingly subject to a different set of rules at this altitude.

The Series 873 is the 12-cylinder version of the Series 870. They were the first MTU armored-vehicle engines with turbochargers and intercoolers.

Looking back The MB 873 engine was designed in the 1970s and was the first MTU tank engine with turbocharging, intercooling and electronic engine monitoring. Today, nearly 40 years later, that drivetrain module is still made almost unchanged. A short while ago, the 4,000th MB 873 engine was completed in Friedrichshafen. MTU has been making the unit as a standard production model for the Leopard 2 tank since 1979. Large numbers have been made not only for the German *Bundeswehr* but also the armies of Switzerland, the Netherlands, Spain, Turkey and Greece.

With a thunderous roar, the monstrous machine appears out of nowhere. Cloaked in a cloud of dust, sand and salt crystals, its outline almost indiscernible, it spears and at an unbelievably rapid 70 kilometers an hour for such a heavyweight through the dry and dusty desert landscape at 4,300 meters above sea level. Then almost 56 tonnes of armored steel comes to an abrupt halt, digs into the rocky volcanic terrain and aims its eleven-meter gun barrel at an imaginary adversary. Just as suddenly, the Chilean Army Leopard 2 battle tank roars off again with the acceleration of its animal-world namesake so as to avoid hostile fire.

The unbelievable agility that in real combat situations can save the lives of its crew is due in large part to the Leopard 2 main battle tank's drivetrain module, an MTU Type MB 873 Ka-501 PowerPack with twin turbochargers and intercooler. With a power output of 1,100 kilowatts (1,500 bhp) the system incorporates all drivetrain components such as engine, gearbox, air filter and cooling system within a compact unit and can accelerate the tank to a maximum speed of 70 kilometers per hour. With the aid of an armored recovery vehicle, the entire drive system can be replaced in the space of 15 minutes.

Low air pressure affects the turbochargers in particular.

On the high plateau of the Atacama region in the north of Chile, MTU engineers put the tanks to the test and adapted them to their new surroundings. The biggest problem was the special climatic and atmospheric pressure conditions in the South American Andes. At high altitudes, the air pressure is lower and that affects the turbochargers in particular. They spin faster but still can't deliver the amount of boost air to the engine that it needs to burn the fuel. As a result, the exhaust temperature increases and the service life of many components such as the exhaust pipes, the turbochargers or the precombustion chambers is considerably shortened. An inconceivable risk for a combat tank. The solution is a special altitude kit for tanks developed by MTU, which improves turbocharger performance and lowers the exhaust temperature. A new impeller in the turbocharger makes sure that even at low boost pressures there is still enough speed in reserve so that the exhaust temperature does not rise too far. In order to prevent the engine overheating, the exhaust temperature is also monitored by a sensor and the engine output then almost unnoticeably throttled back if the temperature gets too high.

> «A special altitude kit prevents the engine from overheating.»

Chilean Leopards soon ready for action.

The altitude kits are currently being fitted to the PowerPacks in the course of servicing. By 2010 a total of 140 of the Leopard Type 2A4 heavyweights will be in service with the Chilean ground forces, the Ejército de Chile, forming the backbone of its armored capability. As part of a multistage modernization program, Chile is replacing its Leopard 1 tanks with modern Leopard 2s acquired from the German *Bundeswehr*. It is the first military power in South America to undertake such a venture.

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1–3 MTU engineers tested the Leopard 2 tanks in a variety of terrains in the Chilean Andes. With a special altitude kit fitted to its engine, the tank can now operate at elevations as high as 4,300 meters above sea level without any problem.