



The Swedish transport and logistic provider Green Cargo is modernizing its rolling stock: by choosing the Type 12V 4000 R43 traction unit supplied by MTU to repower its T44 locomotives it has opted for the most advanced and environmentally friendly technology currently available.

MTU repowers Green Cargo T44 locos

Green future for MTU PowerModules

Green travel on the world's road and rail systems is most definitely in. The Swedish transport and logistics company Green Cargo shows its environmental colors not only in its name – its freight locomotives even carry the “Good Environmental Choice” environmental quality mark of the Swedish Society for Nature Conservation.

And the Swedes are aiming to make their transport systems even more ecologically sound. In 2007 they signed a contract with Bombardier Transportation for the modernization of 42 Type Rc2 electric locomotives and 62 Type T44 diesel locomotives. Included in the package are MTU Series 4000 engines. “Our aim is to achieve competitive and environmentally friendly rail transport logistics. For a figure that equates to only 30 percent of the procurement price of new locomotives, we are getting the tractive power that our clients need for the next 20 years,” revealed Green Cargo CEO, Jan Sundling, when the deal was struck.

The contract is the largest ever agreed for the modernization of rolling stock in Sweden. As well as extending the life of the 104 locomotives by at least 15 years, it also provides for improvements to the driver's cab, lower energy consumption, greater availability and cheaper maintenance costs. The deal also extends to the possibility of combining two locomotive or vehicle types. The train operator will thus benefit from greater operational flexibility.

MTU brought “in the train”.

In December 2007, Bombardier Denmark brought in MTU as repowering provider for the 62 diesel locos – the oldest of which was built in 1968.

The PowerModules with MTU 12V 4000 R43 engines represent the most advanced and ecologically friendly rail traction technology currently available are among the first to meet the new emission limits in force since the beginning of the year. Both the US and European regulators have their sights set on a drastic reduction of emission levels. The top-seller in the MTU range complies with the stricter EU Stage IIIa emission limits for locomotives that came into force this year and most notably specify a substantial reduction of the maximum nitrogen oxide limit to 6.0 grams per kilowatt-hour – and it does so purely on the basis of internal engine design features without the need for external exhaust treatment. “The contract also includes an option for the replacement of 40 more engines – a possibility that can be taken up by the beginning of 2011,” explains Jochen Fehrenbach, MTU key account manager. A maintenance contract is also under discussion. The company will replace the existing two-stroke V12 engines in all of the 62 locomotives with modern MTU four-stroke Series 4000 diesel units. The job is also MTU's first major project involving the repowering of American-design locomotives as the T44 was built by Swedish manufacturer Nohab under license from the American manufacturer EMD.

Emissions 75 percent lower.

In addition to the engine's reliability, end user Green Cargo was impressed by the outstanding ecological credentials of the 12V 4000 R43: “Our requirement was that the environmental aspects should be taken account of in the best way possible, and so we opted for MTU,” relates Peter Forsgren, technical manager for the T44 modernization project at Green Cargo. That is



The MTU engine scores highly on quietness: in the cab of the T44 locomotive you can even hear the birds singing.

because the MTU Series 4000 reduces fuel consumption by 20 percent and the emissions produced by the repowered locomotives are an astonishing 75 percent lower. Another positive feature of the new power units is their quietness in operation. “Whereas previously you couldn't carry on a conversation in the cab of the T44 because of the noise from the engine, the drivers can now listen to the birds singing,” illuminates Peter Pfitzke, technical manager of the Green Cargo project at MTU. The new engines have also reduced external noise levels by a considerable amount. Equally impressed by the degree of environmental awareness was the

Looking back Karl Maybach unveiled his first fast-running diesel engine, the G 4a, at a railway industry show in 1924. The advanced development of it, the GO 5, achieved the unbelievable speed of 160 kph in a train as long ago as 1933. In the 1950s, almost all V200 Class diesel-hydraulic multipurpose locomotives were fitted with twin Maybach MD 650 engines producing 1,100 bhp each.



Green Cargo locomotives are so kind to the environment they carry the quality mark of the Swedish Society for Nature Conservation.



By opting for the MTU 12V 4000 R43, the Swedes have chosen a traction unit that meets the EU Stage IIIa emission standards. Pictured here is the 16-cylinder version of the engine.

Swedish government, which is subsidizing the Green Cargo project to the tune of four million euro.

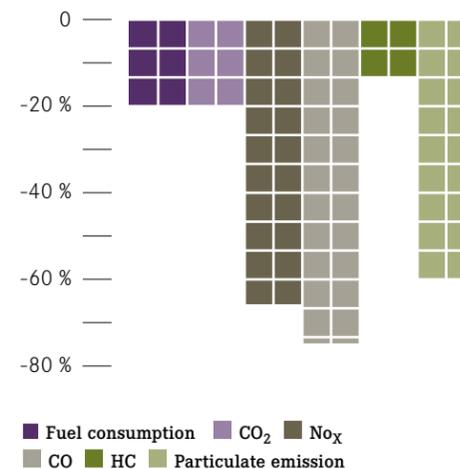
The T44 locos are undergoing comprehensive modernization at Bombardier Denmark, the train maker's center of expertise for refitting diesel rolling stock. That is why MTU is shipping its six-tonne PowerModules, which develop 1,500 kilowatts at 1,800 rpm, a distance of 1,180 kilometers from Lake Constance to Randers in northern Denmark. MTU and Bombardier have together accomplished the repowering of the Green Cargo locomotives in record time. Two prototypes of the twelve-cylinder rail traction module had already left the Friedrichshafen factory in 2008. And Green Cargo took delivery of the first locomotive in January 2009, with

three more to follow by July of this year. "We are contractually guaranteeing lower fuel consumption for these Series 4000s. What is more, the client has the option of having the fuel consumption checked again by us after five years of service," states Fehrenbach in explanation of the special service provided by MTU. Fitted with third-generation common-rail fuel injection, these engines employ phased fuel injection electronically controlled by a computer. The high pressure at which the fuel is injected optimizes combustion and lowers the amount of fuel required. The consequence is less emission of nitrogen oxides, particulates and carbon dioxide.

MTU responsible for complete system. This contract represents the accomplishment of

a rail system supply project for MTU as the company is providing Green Cargo with much more than just engines. The virtually maintenance-free Lechmotoren traction generator of the latest design, the associated rectifiers, regulators and auxiliary generators and the electronics are all part of the contract. The electronic management system being used by MTU is the new powerline system launched last autumn. It incorporates a CANopen bus interface standardized for data communication between engine and management system which passes the traction unit's operating data to the train computer. A fault diagnosis system protects the engine against damage. It constantly checks readings such as the temperature of fuel, intake air, engine oil and coolant. And Green Cargo's choice of MTU means it is fully equipped even

The MTU 12V 4000 R43 improves the environmental credentials of the T44.



for extreme operating conditions, as the engines are designed to cope with ambient temperatures as low as minus 40 degrees Celsius.

So by the autumn of 2011 - thanks to the MTU 12V 4000 R43 rail engines - every one of the 62 Green Cargo T44 locomotives should be doing its job with much less impact on the environment and a lot more quietly than before on the railways of Europe.

ANIKA KANNLER

To find out more, contact:
Jochen Fehrenbach
jochen.fehrenbach@mtu-online.com
Tel. +49 7541 90-7045



MTU tested out an exhaust recirculation system for 5,000 hours under everyday working conditions on a V297 Class shunter.

Ready for future emission limits

In order to meet future emission standards, MTU is focusing research and development on its core areas of expertise of fuel injection, turbocharging, electronics, combustion optimization, choice of materials and exhaust treatment. The challenge is to ensure low fuel consumption at the same time as minimizing CO₂ emissions.

From 2012, the maximum limits for NO_x and HC emissions in the rail sector will be reduced to 4.0 grams per kilowatt-hour, which does not necessarily require the use of exhaust treatment systems for nitrogen oxide reduction. On the other hand, the particulate emission limit of 0.025 ppm applicable to rail engines from 2012 is so low that from that point, new rail engines will most probably be universally fitted with particulate filters. That is because the methods of reducing particulate emissions in use at present - optimizing fuel injection, improving air intake efficiency and modifying combustion chamber geometry - are not capable of achieving such levels. Internal engine design features such as exhaust recirculation, homogeneous combustion and the Miller process or exhaust treatment by means of diesel particulate filter and oxidation catalytic converter will be necessary.

MTU Friedrichshafen and Hug Engineering jointly developed a particulate filter incorporated in the exhaust silencer of the PowerModule traction unit as early as 2006. At the end of 2007, the engine maker successfully tested a rail version of the Series 4000 power unit with exhaust recirculation in a heavy-duty V294 Class shunting locomotive for 5,000 hours under everyday conditions. As part of the "LOCEX" (Locomotive with Clean Exhaust) project, MTU is working with German rail operator Deutsche Bahn on a lightweight exhaust treatment system that also has modest space requirements. Trials have been carried out on a standard Type 8V 4000 R41 engine in a heavy-duty shunter. Soon, the emission control specialists at MTU will be testing out the prototype of a hybrid traction system with exhaust treatment for railcars in a local passenger service train using a Type 6H 1800 hybrid power unit capable of 390 kilowatts. It also recovers energy from braking and uses it for pulling away and in stop-and-go operation. As a result, fuel consumption and carbon dioxide emission can be lowered by as much as 25 percent depending on the route profile.

Green Cargo is a Swedish transport and logistics provider based in Solna, Stockholm, whose core business is in rail freight. Together with its associated partners, the company is responsible for 70 percent of rail goods transport in Sweden. The group is owned by the Swedish government. Employing more than 3,000 people, the business reported turnover of € 585.2 million in 2008.

www.greencargo.com