

TURBOCHARGING

# Norwegian ferry operator Color Line

## Turbocharger upgrade during overhaul delivers value



01 Wärtsilä 8L46 with ABB TPL 73-A30 turbocharger

For leading marine transportation company Color Line optimal engine performance is key to providing services on their four routes linking seven ports. From Norway across to Sweden, Denmark, and Germany the company carries a total of 4.2 million passengers and 960,000 cars and trailers each year.

Onboard one of Color Line's fleet of ferries, Color Fantasy, high engine exhaust gas temperatures on the Wärtsilä 8L46 medium-speed engine were causing load limitation and accelerated component wear in its TPL 73-A30 turbocharger. After consultation with ABB and Wärtsilä, Color Line ordered a turbocharger upgrade which resulted not only in a reduction in the exhaust gas temperatures, but also enabled a slight increase in boost pressure and an expected reduction in the engine's specific fuel consumption.

Since the turbocharger on the W8L46 engine had logged approximately 50,000 running hours, and was already due for overhaul, it was possible to install upgraded components as part of the scheduled replacement of worn and life-expired components. Standard among the parts renewed during a scheduled overhaul is the turbocharger rotor, complete with the turbine and compressor wheel, giving the perfect opportunity to replace the cartridge with a new one and upgrade the compressor wheel, resulting in an upgrade of the turbocharger to

Major Norwegian ferry operator Color Line has carried out its first ABB turbocharger upgrade on a ferry, with the aim of reducing fuel consumption and exhaust gas temperatures of their Wärtsilä 8L46 engines.

TPL 73-A32. In this way, a solution to the engine operating issues was far more cost-effective than with a separate upgrade project. In addition a turbocharger upgrade instead of overhaul reduces the payback time significantly.

### Minimizing downtime

Another important issue for customers is the time involved in completing a maintenance job. With their acquired experience and thorough training, the ABB service engineers, worked with Wärtsilä and the Color Line crew, to perform the turbocharger upgrade onboard the Color Fantasy in less than 12 hours, while the vessel continued its normal operation. This is often possible during an upgrade, where one engine can be closed down without affecting vessel speed.

### Improved performance

With the engine back in service, measurements revealed a drop in exhaust gas temperature of 25 to 30 K, which is a firm foundation for more reliable engine operation. In addition, there was a slight increase in boost pressure from the turbocharger.

Fuel savings from marine upgrades are achievable, however they are variable, depending on surrounding environmental conditions and the vessel's engine operations, which all present a challenge in measuring exact fuel savings. For Color Line

the resultant exhaust gas temperature reduction was well in line with ABB simulations. This strongly indicates fuel savings in the expected range of 0.5 to 0.8 percent.

### Planning and scheduling

After the upgrade, Color Line confirmed that the project did not cause significant disruption to their operations. This is a key focus addressed by ABB and Wärtsilä with all customers considering upgrading their engines and turbochargers. Roger Voldhuset, Chief Engineer, Color Line said, “Color Line ferries follow a tight schedule, but this upgrade caused no delays in vessel operation. Discussions and preparation for the new compressor stage began well in advance of the up grade, so with proper planning like this, it could be scheduled with minimal downtime. We would definitely recommend other customers to carry out a component upgrade on their ABB turbochargers and, like ourselves, to have it done during a scheduled major overhaul.”



This upgrade is an excellent example of two OEMs; Wärtsilä and ABB, joining forces to bring additional value to the customer. The service package that saw ABB work together with Wärtsilä delivered additional benefits with all work being carried out effectively by one party, reducing the complexity of having to engage different suppliers through varying

#### Challenge

- After 50,000 running hours the turbocharger was due for overhaul
- Color Line wanted to achieve fuel savings
- Excessive exhaust gas temperatures were posing a potential problem to the turbocharger performance
- Minimizing downtime was a specific concern

#### Solution

- ABB in cooperation with Wärtsilä implemented an upgrade of the turbocharger, in place of the scheduled overhaul
- This meant installation of newer components, which provide additional benefits
- Carrying out an upgrade in place of the overhaul lowers investment by the customer and reduces payback significantly

#### Outcome

- Exhaust gas temperatures were reduced by 25 – 30K
- Data indicates potential for fuel savings would be in line with expectations
- Overall lifetime of the turbocharger components has been extended and performance improved
- The entire project including measurements and engine matching was completed in less than one week with the vessel remaining in operation on schedule

contract agreements. “The overall package price for parts, upgrade, testing, NOx measurement and an amended Technical File is very important and the job was completed according to plan,” confirmed Niklas Nygren, First Engineer, Color Line.

### Turbocharger lifetime and performance

As the Color Line ferry demonstrates, a turbocharger upgraded with new generation components contributes to maximizing the full potential of the engine. The result is higher operational efficiency and lower fuel consumption, all achieved while minimizing emissions, which was another important element of this upgrade. Overall, this means: extending the turbocharger’s lifetime while improving engine performance, which translates into savings in operating costs (OpEx). Consequently, following completion of the project, Color Line has decided to up-

grade a second engine on the same vessel to further prove the benefits.

To minimize downtime on all service and maintenance work, ABB operates a wholly-owned network of more than 100 Service Stations in over 50 countries, equipped to service the full range of ABB turbochargers and with specially trained engineers.

Wärtsilä is a global leader in advanced technologies and complete lifecycle solutions for the marine and energy markets operating in over 200 locations, in more than 70 countries. By emphasizing sustainable innovation and total efficiency, Wärtsilä maximizes the environmental and economic performance of the vessels and power plants of its customers. [www.wartsila.com](http://www.wartsila.com)