Non original parts and non original service – worth the money?
Rectifying turbocharger faults arising from non original parts fitted during non original service has become a core competence of ABB Turbocharging Service Stations.

Geometry
Turbocharging efficiency depends on tight clearances between the rotor and its housings. They are in the region of 0.66 mm – the thickness of about 5 human hairs. In a logarithmic progression, an increase of only 0.1 mm would mean a turbocharging efficiency loss of over 1%. Similarly, aerodynamic efficiency can be severely affected by turbulences caused by rough internal surfaces and steps at joints.

Double trouble
These potentials apply to both the turbine and compressor. Their cumulative effect could lead to an appreciable deterioration in fuel consumption. Consider: just 1 % lower fuel efficiency on a 10 MW medium- or high-speed engine equates to 140 tons of fuel worth USD 70,000 * per year.

Engine operation
Out-of-spec parts can prevent steady state turbocharger operation (surging) or make it only achievable at reduced engine power and fuel efficiency. This leads to:
- Enforced slow steaming/slippage in vessel schedules
- Reduced electrical power generation
- Reduced transient response
- Excessive vibration leading to accelerated wear and reduced safety

Safety
The failure of turbocharger casings to contain rotor fragments could lead to consequential losses, including severe personal injuries. Turbocharger failure leading to complete loss of engine power could leave a vessel “dead-in-the-water” on the high seas or a town without electrical power.

Operating economics
Rectification of non original service work using non original parts leads to:
- Duplication of repair costs
- Delayed departure/extra harbor dues as high as USD 15,000 ** per day
- Possible cost of additional sea trials
- Possible cost of new turbocharger

Environmental impact
Higher fuel consumption leads to higher emissions of greenhouse gases. Increased harmful emissions – especially NOₓ and visible particulates – can lead to:
- Loss of incentives, e.g. Norway
- Prohibition from port entry
- Fines
- Unpleasant environment for cruise or ferry passengers

* assumes SFC 200 g/kWh, 7000 running hours, fuel 500 USD per ton.
** 70,000 GT container ship overstaying 5 day fee period, Hamburg.

<table>
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<th>Deviation from ABB specification</th>
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The table shows major areas where inaccurate machining, out-of-specification materials and poor surface finish on gas and air path components can affect turbocharger performance.