

TPL and TPS Series Turbocharger

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1. Introduction

In recent years, with the enhancement of powers and fuel efficiencies of marine diesel engines, turbochargers are also required to provide higher efficiencies and pressure ratios. Besides these technical requirements for engines, turbochargers are now strongly required to provide such better qualities as longer maintenance intervals, improved workability and reduced lifecycle costs. To meet these requirements, the Turbocharger Power range Large (TPL) and Turbocharger Power range Small (TPS) were developed by ABB Turbo Systems (ABB) in Switzerland and have been produced since 1996. In Japan, Turbo Systems United Co., Ltd., a joint venture operation between ABB and IHI, started to import and sell them in 1999. We shipped the TPL85B and the first TPL model in January 2003, the TPL73B in August 2003, the TPL77B in January 2004 and the TPS52D in February 2004. Volume of production for TPS57D will be ready in 2004.

2. Features of the TPL and TPS Turbochargers

The TPL models are divided into the following two types according to the types of applicable engines: versions A (TPL-A) and B (TPL-B). Each TPL model consists of an axial turbine and a centrifugal compressor, along with a bearing placed between the compressor and turbine. The TPL models use the center-support bearing system and are large-size turbochargers.

The TPS models are divided into the following three types according to the size of the compressors: versions D (TPS-D), E (TPS-E), and F (TPS-F). Each TPS model consists of a mixed flow turbine and a centrifugal compressor. Like the TPL models, the TPS models use the center support bearing systems and are small-size turbochargers. Figure 1 shows the bird's eye view of the TPL-B and TPS respectively. Tables 1 and 2 show the fundamental specifications of the TPL-B and TPS-D respectively.

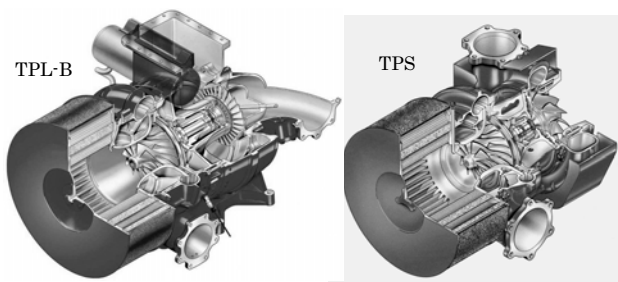


Fig.1 Bird's eye view of the TPL-B and TPS

Table 1 fundamental specifications of the TPL-B

	TPL73B	TPL77B	TPL80B	TPL85B
Volume flow rate range ^{**1} (m ³ /s)	10 - 16	13 - 22	18 - 30	26 - 43
Applicable engine output (kW)	5000 - 8000	6500 - 11000	9000 - 15000	13000 - 21000
Dry mass (kg)	2510	3860	6010	10110

(Note) ^{**1}: The values shown are based on $\pi_c=3.5$

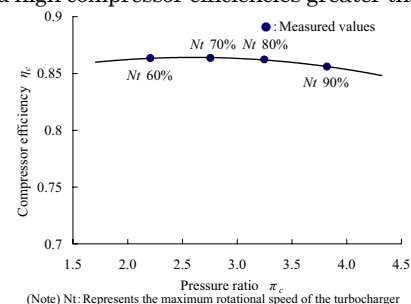
Table 2 fundamental specifications of the TPS-D

	TPS48D	TPS52D	TPS57D	TPS61D
Volume flow rate range ^{**1} (m ³ /s)	0.9 - 1.7	1.4 - 2.5	2.0 - 3.7	2.9 - 5.3
Applicable engine output (kW)	550 - 1000	800 - 1500	1150 - 2200	1700 - 3100
Dry mass (kg)	137	202	330	568

(Note) ^{**1}: The values shown are based on $\pi_c=3.5$

3. Evaluation tests

A variety of evaluation tests were conducted so that we can produce and sell (localized) TPL and TPS turbochargers. For the tests conducted on the TPL85B, which has accomplished localization, the compressor performance test is described below. As for the rotor used for the evaluation test on the TPL85B, the maximum outlet diameter of the compressor impeller is about 850mm. Figure 2 shows the results of the compressor performance test. The horizontal axis (π_c) of the chart represents the ratio between the total pressures at the compressor inlet and outlet, and the vertical axis represents the compressor efficiency (η_c). The measurement points, which are selected near the middle point, were placed at four rotational speeds: 60%, 70%, 80% and 90% of the maximum rotational speed of the turbocharger. Figure 2 indicates that the measurements at most of the rotational speeds showed high compressor efficiencies greater than 85%.



(Note) Ni: Represents the maximum rotational speed of the turbocharger

Fig.2 Compressor performance test results

4. Conclusions

With the environmental deterioration seen in recent years, the introduction of high-performance turbochargers on the market provides very high expectations for addressing the raised awareness of environmental issues and the laws regulating exhaust gases. It is hoped that this document will help develop turbochargers.