

ANALYSIS OF TECHNOLOGICAL PROCESS OF INSTALLATION TURBOCHARGERS

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Abstract

The technological process of installation of turbocharger as well as detailed analysis of chosen stages of installation having fundamental influence on the correct work of the turbocharger are presented in the article.

The purpose of this article is performance of whole process of installation turbocharger as well as analysis of particularly significant stages of this process. The creature of turbocharging and it is myself this of working of turbocharger is enough simple. Difficulties appear if we put to the analysis conditions work of turbocharger: high temperature of fumes, variable loads, aggressive environment of combustion gases, high rotatory speeds of rotors.

Some of exploitation problems are possible to the elimination on the design stage or by means of application of appropriate materials. However technological process of installation is responsible for output quality and failure-free lasting work of turbocharger.

In the process of installation it can distinguish some essential stages: processing and installation of shaft with the turbine's rotor, the weighing of turbine's rotor and the compressor, the installation of rotor's group, weighing of rotor's group in the trunk, positional tests under load. High rotatory speeds cause during work of rotator so that created during of installation of turbocharger inappropriate balancings can bring to important damages of turbocharger.

The correct course of process of installation and the final verification on braked position allows to avoid most of breakdowns of turbocharger group as well as to ensure long term of correct exploitation. From this reason very important is detailed analysis of respective stages of installation of group.

Keywords: *turbocharger, installation of turbocharger's group, turbine's rotor, compressor's rotor*

1. Introduction

In dependence from size of turbocharger and also degree of her of complexity process of installation is various. Large rechargeable turbochargers for example the shipping engines have very complex the construction [1, 2]. There are controlling and directing systems and also

turbine's rotor can contains group of the single shovels (Fig. 1a). Small turbochargers used in the passenger cars have also more and more complex construction, and equipped in systems controlling of quantities or direction of supplied fumes on turbine (Fig. 1b) [6-9].

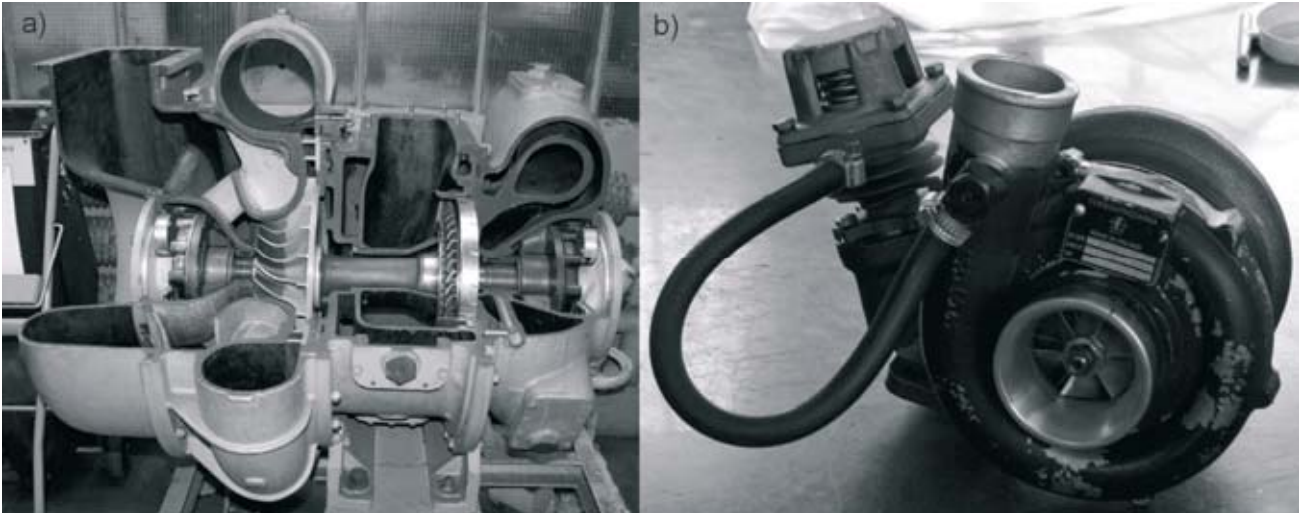


Fig. 1 View of turbocharger a) shipping engine - type 51, b) SW680 engine - type B65

Process of installation of turbocharger has fundamental influence on later and failure-free work. Before beginning of this process the selection of half-products is carried out i.e. casted components of turbocharger to which elements of trunk belong as well as turbine's rotor and turbine's compressor belong. These elements later are put to mechanical processing in order to obtain final shape particularly in installed places. In the trunks surfaces of joining or aperture on screws as well as oil canals are processed (Fig. 2). In case of rotors shovels can be processed in order to obtain appropriate external diameter of rotor as well as aperture under roll (very often for compressor's rotor). The roll is fastened to turbine's rotor for example by means of the frictional welding and next mechanically processed as one element.

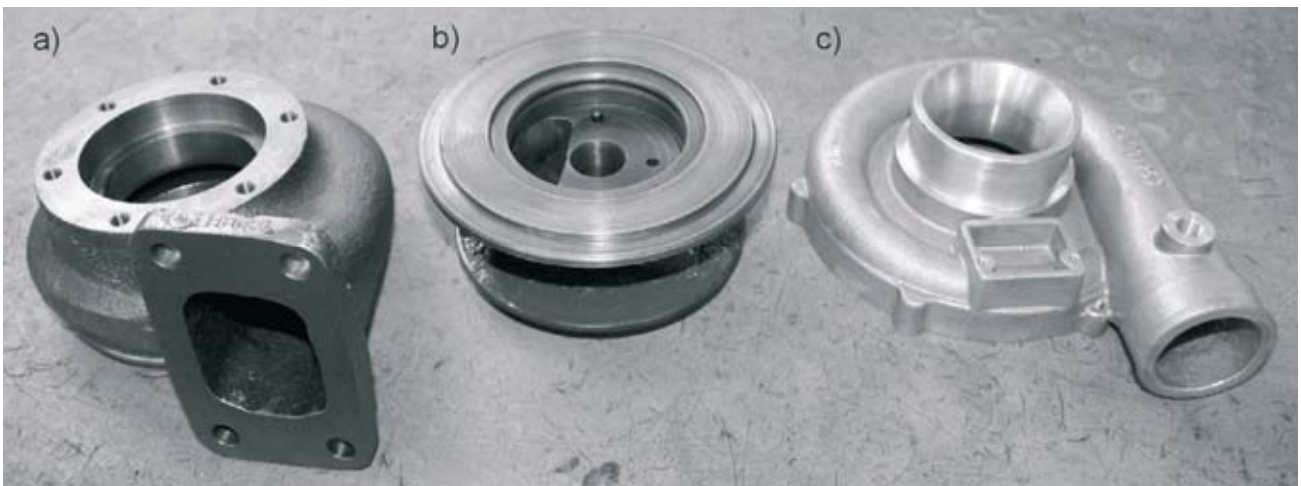


Fig. 2. Main components of turbocharger's trunk: a) turbine's trunk, b) central trunk, c) compressor's trunk

2. Principal stages of installation process

Principal process of installation begins after finishing of mechanical processing of respective elements. On this stage very important is matching of respective elements on the basis technical documentation (Fig. 3). Current level of control and also verification of parameters work of installed turbocharger is realised in accordance from diagram shown on Fig. 4.

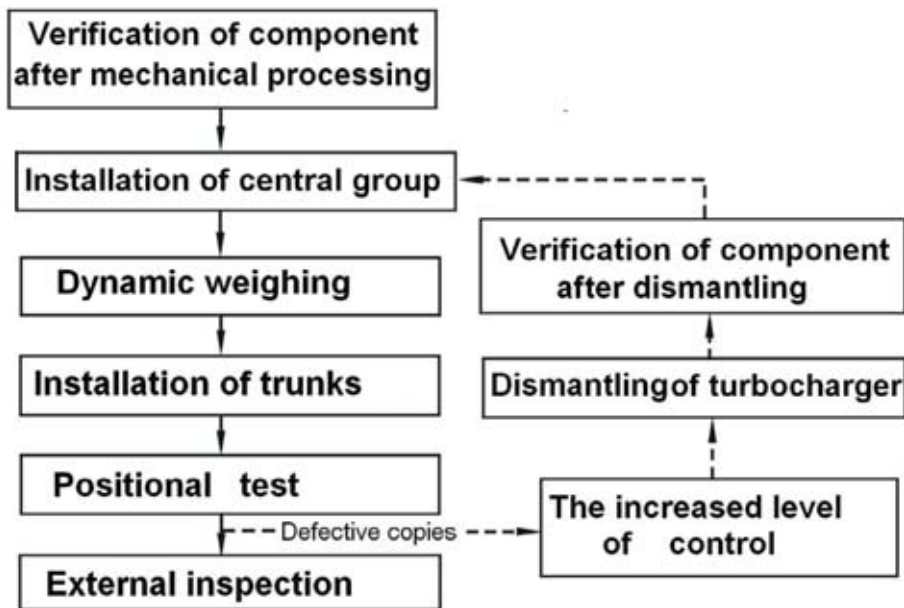


Fig. 3. Diagram of process of installation turbocharger

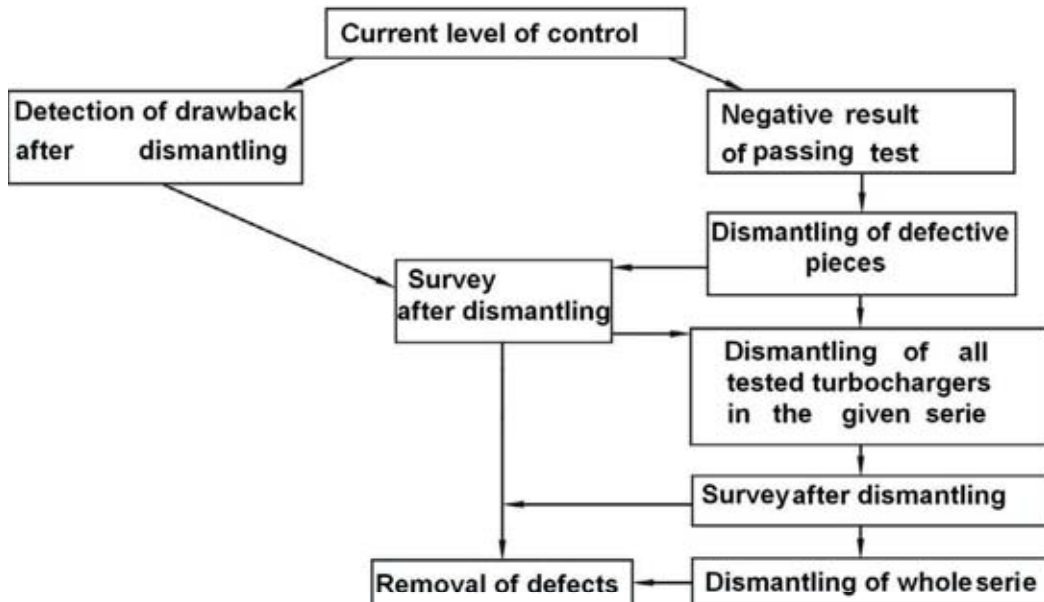


Fig. 4. Diagram process of control installation turbocharger

Principal influence on durability of turbocharger has yet process of weighing and installation rotator. Process of weighing was shown in detail in publications [3, 4]. Principal stage of installation are positional tests, during which besides of characteristics work of turbocharger accelerations of vibrations are tested and generated mainly by means of rotators.

3. Verification of process of installation turbochargers - positional tests

Verification of correctness of installation is carried out during of positional tests, where besides of characteristics work of turbocharger accelerations of vibrations are tested and generated mainly by means of rotators. Position to the testing must be matched to size of turbocharger. Turbochargers can be installed on universal positions for given sizeable interval or specialised positions to concrete model. Universal positions have the appropriate fastening aggregates enabled installation of different models (Fig. 5). Aggregates of this type are equipped in appropriate connectors, passing components, bands, universal fastening accessories etc.

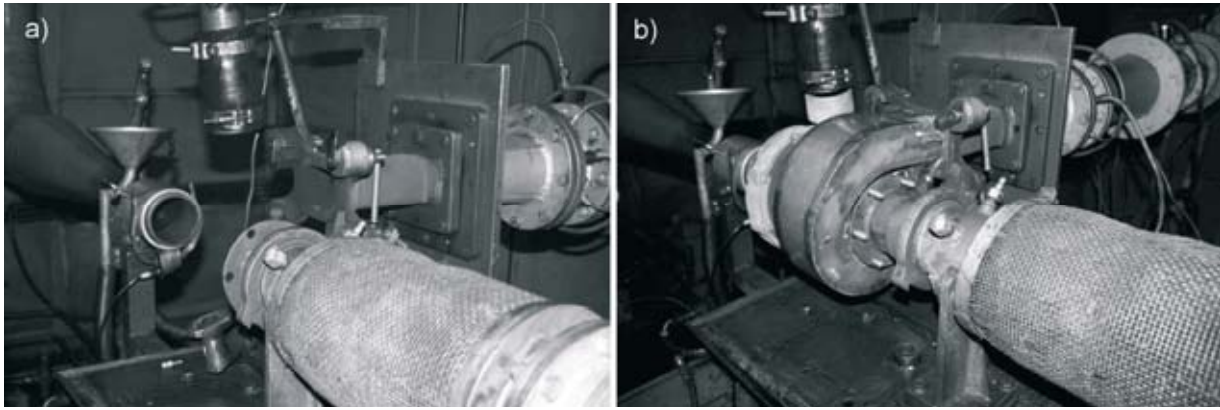


Fig. 5. Installed grips of universal tested position a) without turbocharger, b) with fastened turbocharger

Shortening of time of fastening and it is myself these braked tests can be obtained by means of application of automatic installed systems (Fig. 6). Automated positions are equipped in connectors matched to one type of turbocharger and controlled e.g. by means of electric - hydraulic systems.

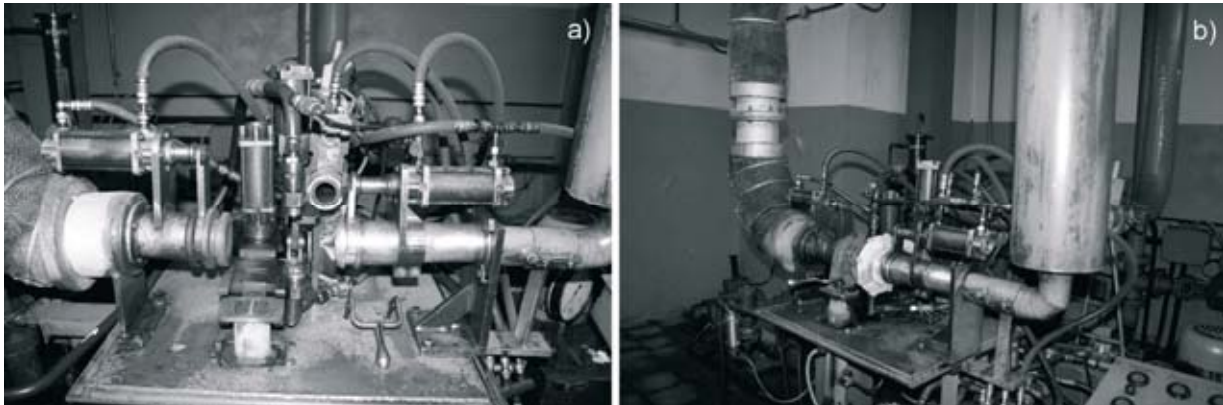


Fig. 6. Installed grips of automatic position to the testing with aggregate of hydraulic controlled servomotors a) without turbocharger, b) with fastened turbocharger

The measurement of vibrations executes by means of installed magnetical sensor on trunk of turbocharger. However measurement of accelerations of vibrations executes on trunk of turbocharger, and this measurement refers to rotator of turbocharger and determines in indirect method vibrations occurring in system.

In most cases, vibrations and especially them accelerations decide about usefulness of turbocharger to the exploitation. The level of accelerations of vibrations is one with fundamental requirements guaranteing correct work. Measurement executes in measure points in time of set movement for different values of rotatory speed of rotator. Conditions of reception determine values of maximal permissible accelerations in dependence from rotatory speed of rotor of turbocharger.

On the basis of shown braked tests is possible to the statement, that by means of appropriate selection of constructional and technological parameters of rotator is possible to guaranteing correct parameters of work of turbochargers with regard to level of vibrations.

It is important of recognition of excessive vibrations in order to assure appropriate functionality of turbocharger, and then minimalizing of these vibrations. Theoretical bases of reasons of creation of vibrations in rotators and also principles of control and verification during of positional tests are possible to the finding in the works [3-5].

5. Conclusions

Process of installation turbochargers contains many stages having influence on failure-free work. Rotator of turbocharger works with very high rotatory speeds, therefore even small

inappropriate balancings of this system cause vibrations and which can bring about important damages. From this reason one with the most important stages of process of installation is weighing of rotors and whole system in trunk. Determining of level of vibrations is realised on braked position. Positional tests composes returnable information with regard to correctness of whole process of installation. The different proportional quantities of produced turbochargers are put to control in dependence from recommendations of quality control and requirements customer. In case of random control universal braked positions are possible to application. If most of turbochargers are put to control it is worth to build positional tests equipped in automatic or half - automatic systems of fastening turbochargers. Automatic method of fastening accelerates considerably process of positional tests.

Turbocharger, which does not realise of requirements of technical reception is put to dismantling and verification in order to determine reasons of incorrectness work. One with very often met of incorrectness work is exceeding of level of vibrations. Reason of exceeding of level of vibrations can be inappropriate balancing of rotator. Other necessary reason of vibrations to suspecting is also in resistance of the centre, in which rotors work. Important meaning in work of rotor has also method of the bearing. Sliding bearings in which rotor is placed can be reason of creation of the destabilized hydrokinetic powers, and these in turn self-induced vibrations in layer of oil.

In next order it is necessary to remove reasons of incorrectness of work turbocharger and to repeat process of installation. Installed turbocharger is put to control again about increased degree.

6. Literature

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