

Reduction of the overall cost of the balancing system

Shorter manufacturing and installation times

Less space requirement

Shorter evacuation time, even with less vacuum capacity

Easier and faster handling

Economic solution to modernize existing balancing and spin test facilities

New Safety Concept for High Speed Balancing

Application

Bladed rotors to be high speed balanced usually run in vacuum chambers to avoid the high turbulence power loss. The development of a new type of vacuum chamber with integrated burst protection makes high speed balancing and

spin testing of small to medium sized turbo rotors (compressors, steam and gas turbines) possible. The installation is mounted right on the shop floor, without the usual, expensive protective building.

Design

The design of a high speed balancing system with the new vacuum chamber and integrated burst protection is shown on the sketch. A vacuum chamber which is just large enough to contain the largest rotor, is set on the foundation frame. The vacuum seal is attained at the foundation frame and the end walls of the drive unit. For loading, the complete chamber is moved axially by motors drives mounted on the sides of the chamber. The interior of the chamber contains several steel liners which act as burst protection. The innermost liner serves - in case of lighter bursts - as an interchangeable part (fragment layer). In the closed condition, the burst chamber is coupled to deformation elements which are an integral part of the foundation intended to deform and absorb damaging forces caused by heavy bursts.

The Schenck Safety Philosophy

In an extreme case it is assumed that the largest rotor for which the system is designed would burst into several parts either at balancing speed or spin test speed. Even though experience shows that such an accident case is very unlikely, it cannot be ignored, and the design of the burst protection shrouding must consider such extreme cases. This also ensures that for the lighter cases, which can happen more often, a large margin of safety is maintained. When a fragment collides with the shroud, a "plastic impact" occurs. The fragments intrude into the inner line without penetrating the chamber wall. In accordance with the laws of impulse and momentum, after the "plastic impact", the remaining kinetic energy is absorbed by the deformation elements. It may happen that the chamber is lifted by a small amount for a fraction of a second. The design, however, ensures that no fragments can escape to the environment.

Rotor-Specifications

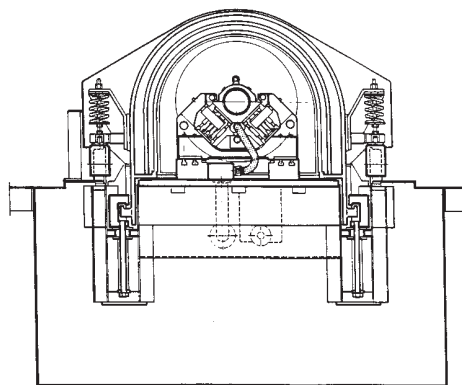
This new modular system is available for all high speed balancing facilities up to size DH 7.

This covers the following rotor specifications:

- Rotor weight up to approx. 8000 kg (17,600 lbs)
- Rotor diameter up to approx. 1700 mm (67 in)
- Rotor length as required
- Balancing and spin testing speeds for smaller rotors up to 63,000 rpm

In accordance with customer demands, Schenck can supply either the complete hardware or the manufacturing drawings.

By developing this concept, new standards for building small high speed vacuum balancing systems were established.



Cross section of a DH4 balancing facility with integrated burst protection.

SCHENCK

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