Goa Instruments Industries Pvt. Ltd.

YEAR – 01, VOL:I **NEWSLETTER** Edition:DECEMBER-2012

Thank you again for sparing your time for the newsletter ! I hope these newsletters are useful.

In this edition we are providing some information on various tests which are carried out on thermowells. Please note that some of these are few special tests widely used in the industry & are only provided as per the requirements.

NDT's on Thermowells

The abbreviation **NDT** stands for "**N**on-**D**estructive **T**esting". This is used to refer to non-destructive inspections or tests on components in general.

Common non-destructive tests are the pressure test and for welded thermowells, the liquid penetrant test. In addition, to test the bore concentricity, ultrasound or X-ray testing is possible. To test the sealing, helium leak testing is an option. The surface finish or surface hardness may also be tested. A material test would be Positive Material Identification (PMI test). Details of few tests are given below:-

Hydrostatic pressure test

The hydrostatic pressure test is a pressure and strength test of the components of a thermowell in accordance with the AD2000 data sheet HP30. For the test, the thermowell is clamped into a test fixture and loaded at room temperature with a defined test pressure and duration . In general, one differentiates between external and internal pressure testing. Typical test pressures are 1.5 times the nominal pressure of the flange with external pressure, or 500 bar with internal pressure. The test is performed with water with a chloride content < 15 ppm.

Helium leak test

For leak testing in accordance with DIN EN 1779 (1999) / EN 13185, helium 4.6 is used as a test gas. The test is able to detect minimal leakage rates and is considered the most sensitive test method for leak testing. In general, one should distinguish between an integral and local test method.

PMI test

The PMI (positive material identification) test proves which alloy constituents exist in the material. There are various common test procedures. With optical emission spectrometry (OES) in accordance with DIN 51008-1 and -2, an arc is generated between the thermowell surface and the test equipment, and the spectrum of this arc enables the alloy's elements to be identified – both qualitatively and quantitatively. A test procedure which doesn't damage the surface is X-ray analysis; during the X-ray the atoms of the thermowell material are energised until they radiate themselves. The wavelength and intensity of the emitted radiation is again a measure of the alloy's constituent elements and their concentrations.

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Dye penetrant test

With the penetrant test in accordance with DIN EN 571-1, fine surface cracks and porosities in weld seams can be made visible. After cleaning the surface to be inspected, a contrast agent (red or fluorescent) is sprayed on. Through the capillary effect, this agent penetrates any surface defects there might be. After re-cleaning the surface, a developer (white) is then sprayed on, which extracts the contrast agent (from any hairline cracks, etc.) and through colour contrast, enables an easy evaluation of the defects.

X-ray testing

Through an X-ray test to EN 1435 or ASME Section V, Article 2, Edition 2004, for example, full penetration welds on thermowells can be investigated with respect to irregularities (cracks, voids, insufficient bonding). An X-ray examination can also be used to record the bore concentricity in solid body material thermowells. For this purpose, two images of the thermowell tip at 90° to each other are required.

Ultrasonic test

Through an ultrasonic test to DIN EN ISO 17640, for example, full penetration welds on thermowells can be investigated with respect to irregularities (cracks, voids, insufficient bonding). To do this, the reflections of a radiated ultrasonic signal from the interfaces of irregularities are measured. To determine the position of the irregularities, the ultrasound machine is set in advance with the aid of a reference body. The ultrasonic method can also be used to measure the wall thickness of a solid body material thermowell, in order to determine the bore concentricity.

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