

OPTOINSPECT® – Tube

3D Measuring System for the Geometric Quality Inspection of Pipes and Hoses



Pipes and Hoses

The Technology

The »OPTOINSPECT®« is a technology for the geometric quality inspection of pipes and tubes in manufacturing.

The fully automatic quality inspection is subdivided into two process steps:

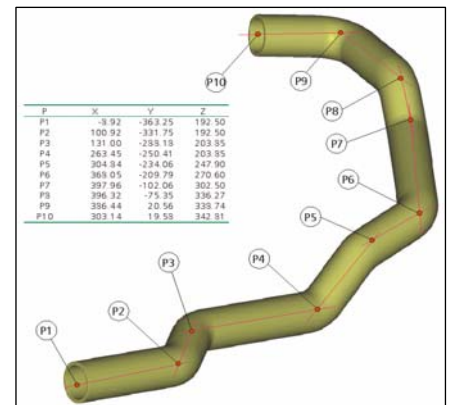
- digitalization and
- analysis and evaluation.

DIGITALIZATION is the process step for the contactless measuring of the three-dimensional geometry of pipes and tubes. Approximately 100° of the cylinder-like lateral area is measured. The result is a set of several thousand measuring points, a so-called 3D point cloud.

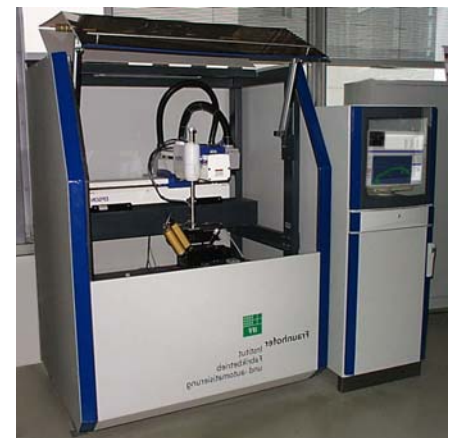
ANALYSIS AND EVALUATION are the process step for the extraction of quantitative features from the digitalized 3D point cloud. The shape of the pipes and hoses can be described as any combination of curvatures, linear segments and connection elements. The objective of the analysis and evaluation is to describe the curvatures and linear segments by cylinders in order to calculate a center line (neutral axis) from this. From this data, Cartesian coordinates are calculated (XYZ) for the virtual interfaces of the linear segments and plotted in table form.

line optics. A motion system with four degrees of flexibility (XYZU) is used.

The pipes and hoses are digitalized by means of the sensor moving over the contour, the path of the robot being determined online from the 3D measured values.



Measurement Readout



3D Measuring Machine

Fraunhofer Institute for Factory Operation and Automation IFF

Sandtorstrasse 22
39106 Magdeburg
Germany

Contact:
Measurement and Testing Technology
Business Unit
Dr. Dirk Berndt
Business Unit Manager
Tel.: +49 (0) 3 91 / 40 90-224
Fax: +49 (0) 3 91 / 40 90-250
e-mail: Dirk.Berndt@iff.fraunhofer.de

Ralf Warnemünde
Deputy Business Unit Manager
Tel.: +49 (0) 3 91 / 40 90-225
Fax: +49 (0) 3 91 / 40 90-250
e-mail: Ralf.Warnemuende@iff.fraunhofer.de

The Measuring System

The measuring system » OPTOINSPECT® – Tube « consists of a split-beam sensor and a kinematic motion system. The sensor works according to the triangulation principle and consists of a high-speed CMOS camera with integrated hardware preprocessing and a diode laser with

The Results

- XYZ coordinates of points on the neutral axis,
- Variance analysis of the measured data with reference or CAD data