

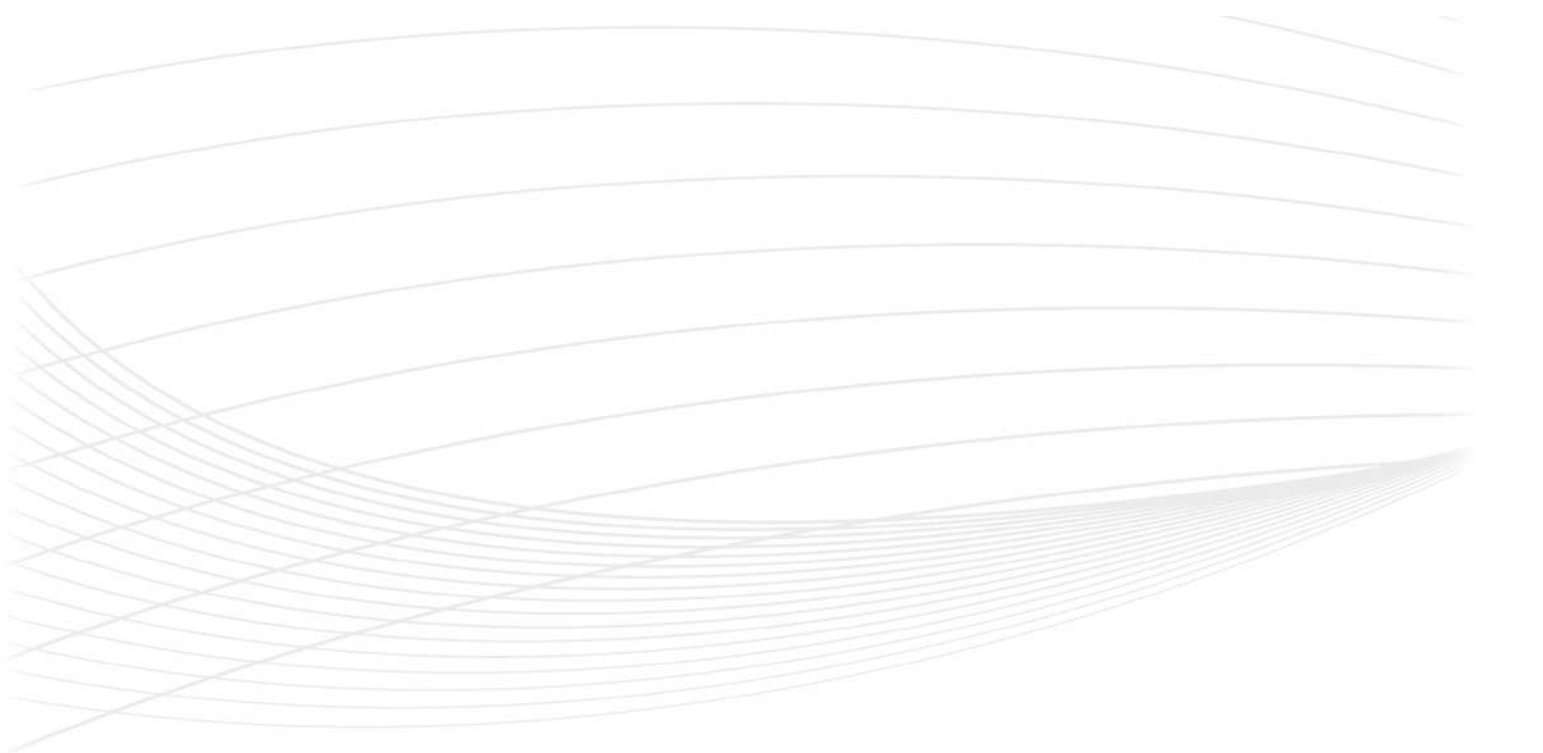


SINT
Technology

Centre of excellence in measurement technology



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SINT TECHNOLOGY

Company

The company has been in business since 1990 and is located in Calenzano, a few kilometres from Florence.

Initially focusing on research and development for small and medium-sized enterprises and measurement and testing services for the mechanical engineering industry, the experience and competency that have been acquired in this area have led to substantial expansion and the company now provides a diversified range of services and products also for large companies at national and international level.

SINT Technology's global solutions include operations at its headquarters, where it has its own laboratory, and on field, from workshops to plants, assuring customers services based on flexibility, speed and accuracy.

Organisation

The company has a staff of over 40 engineering technicians highly skilled in measurement, analysis, diagnostics, and mechanical and electronic design engineering.

SINT Technology's main business activities are:

Laboratory measurement, testing, analysis and diagnostic services applied to stress, vibration, noise, emissions and the thermodynamic performance of machinery and plants.

Production of measurement equipment for special applications, including metal materials and works of art.

Mechanical and electronic design engineering of special equipment.

Design engineering and production of specific custom-made software and of the software incorporated in measurement equipment produced by SINT Technology

Specialist technical services: technical support in design engineering and project management relating to energy industry machinery and plants.

Training: a centre approved by CIC-CPND (the Italian Coordination Centre for Non-Destructive Testing) for level 1 and level 2 certification courses and examinations for electrical resistance strain gauge testing engineers.

GHG emissions support services: evaluation of measurement uncertainties, including calculation, and support to businesses in reporting carbon dioxide emissions.

Subsidized research: consulting services for small and medium-sized enterprises concerning research and development of technological innovation and access to related subsidies authorized under Italian law.

Certifications

Certification of conformity of the Management System to standards ISO 9001 and OHSAS 18001



CIC-PND approval as an examination centre for certification of electrical resistance strain gauge testing engineers



Recognition by the Ministry of Education, Universities and Research.



ACCREDIA accreditation of SINT Technology's test laboratory with certificate no. 0910.



MEASUREMENT AND TESTING LABORATORY

SINT Technology conducts laboratory tests on its own premises and on site.

- Machine and plant performance
- Reciprocating compressor diagnostics
- Experimental stress analysis (strain gauge measurement, residual stress)
- Torque and torsional vibration
- Vibration
- Experimental modal analysis
- Noise
- Videoscope inspections
- Other measurements of operating parameters in industrial processes

1 Vibration measurement and analysis

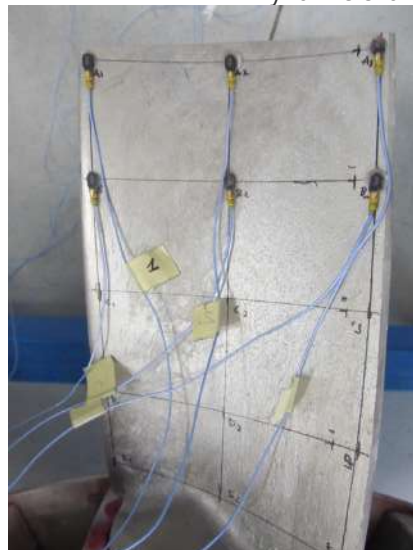
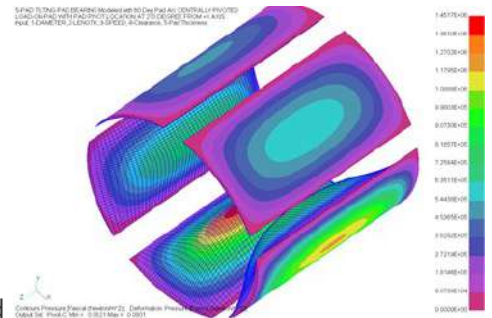
Vibration measurement and analysis is an important instrument for characterization, monitoring and diagnostics of machinery, structures and plants.

SINT Technology can provide a comprehensive service including:

- Examination of the problem
- Testing design engineering
- Supply of the measurement system
- Management and performance of measurement operations
- Analysis, diagnosis and study of corrective action

SINT Technology has many years of experience in vibration measurement and analysis and can offer a wide range of services, for example:

- Measurement and analysis of vibration on rotating and reciprocating machinery
- Troubleshooting
- Condition monitoring for predictive maintenance
- Torsional vibration
- Modal analysis of the machine and piping
- Trim balancing
- Advanced experimental modal analysis
- Rotordynamic analysis (API lateral and torsional analysis)
- Dynamic characterization of materials

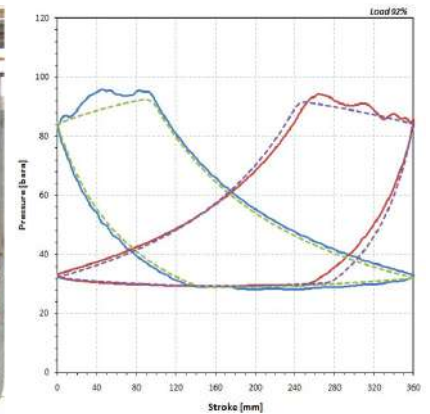


2 Reciprocating compressor diagnostics

SINT Technology has specific competencies and established procedures for reciprocating compressor monitoring.

SINT Technology has a long track record in reciprocating compressor diagnostics and can provide a wide range of services, including:

- Measurement and analysis of absolute pressure vs. piston displacement
- Measurement of vibration on the machine and piping
- Measurement of the temperature of valve covers
- Measurement and analysis of pressure pulsations
- Modal analysis of the machine and piping
- Measurement of valve acoustic emissions
- Thermographic measurements
- Measurement and analysis of torsional vibration
- Measurement of torque
- Measurement of electric power consumption

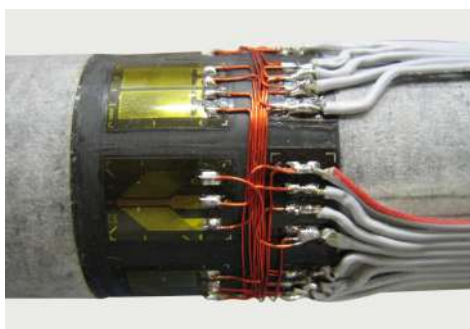


3 Strain gauge measurements

Backed by many years of extensive experience in this field, along with in-depth study of strain gauge measuring techniques in collaboration with research centres and universities, **SINT Technology offers strain gauge measurement products and services that range from production of measurement equipment to performance of strain gauge tests, from training skilled engineers to certification with CIC-PND approved examinations.** SINT Technology is an Examination Centre for certification of electrical resistance strain gauge measurement engineers.

SINT Technology has exclusive competencies in use of electrical resistance strain gauges for measurement of stresses also in complex applications. In fact, **stress measurement is not restricted to industrial machines but extends to the most diverse applications requiring particular sensitivity and accuracy: motor vehicles, complex structures made of steel and metal alloys, structures made of composite construction material, mortars and cements, marble and works of art.**

SINT Technology can rely on the expertise of several CIC-PND Level 2 and Level 3 skilled engineers.



4 Measurement of machine and plant performance

SINT employs advanced measurement and analysis techniques on cutting-edge technology machinery and plants:

- Gas turbines
- Steam turbines
- Centrifugal and axial compressors
- Reciprocating compressors
- Centrifugal and reciprocating pumps
- Waste heat boilers
- Simple-cycle and combined-cycle electric power plants
- Waste-to-energy plants

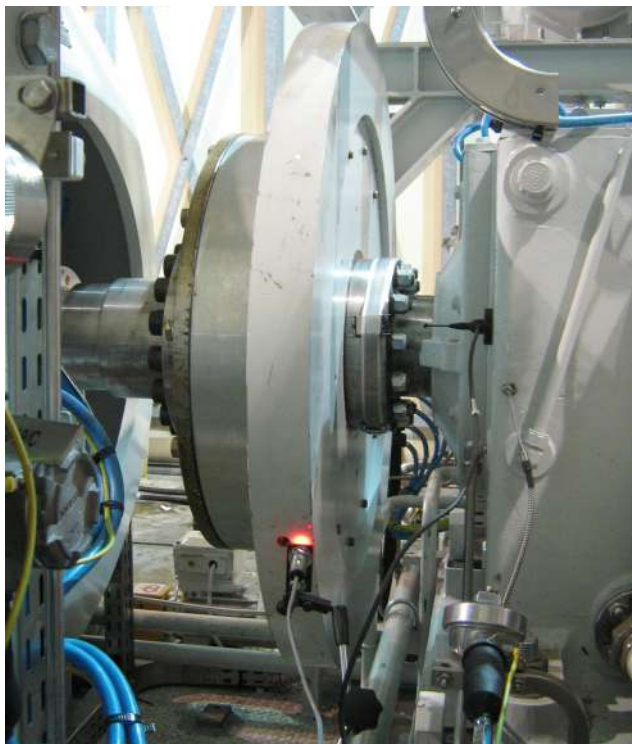
SINT Technology delivers complete solutions for machinery and plant performance testing, including:

- design engineering of testing
- supply of measurement instrumentation including installation and data acquisition
- own skilled testing engineers.



5 Measurement of torque and torsional vibration

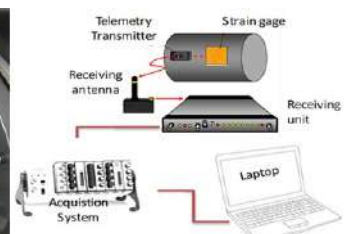
SINT Technology can apply various telemetry acquisition systems for measurement of torque and torsional vibration in both transient and normal operating conditions.



Analysing **vibration and torsional resonance** is an extremely effective diagnostic tool for identifying abnormal conditions during operation of a machine which can lead to damage, such as:

- Coupling/drive shaft failure
- Accelerated gear wear and gear tooth failure
- Key deformation
- Slippage of coupling hubs
- Premature wear of electric motor windings
- Irregular output

Measurement of torque and shaft speed allow transmitted mechanical power to be determined.



6 Residual stress measurements by strain gauge methods

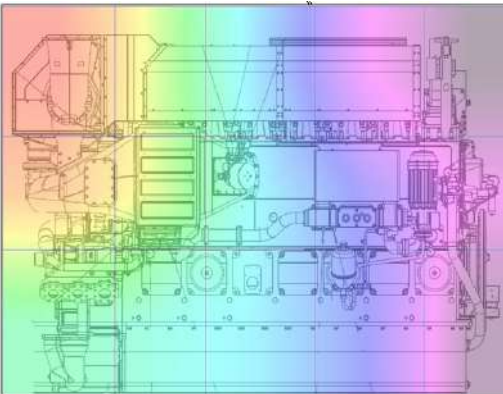
SINT Technology is a laboratory specialized in measuring residual stresses by strain gauge methods.

The company has in-depth experience of:

- the hole-drilling strain gauge method
- the ring core method
- the sectioning method
- the Sachs method (boring-out)



7 Noise and sound intensity measurements. Acoustic treatment servi-



Noise is one of the parameters that most conditions the environment in which we live. It is a requirement of prime importance that the manufacturers of machinery, plants and other production facilities, the operators and those who work in the environment concerned keep noise level under control.

Reliable accurate measurement of noise level is essential both for identifying sources of noise, and therefore for finding a remedy, and for checking compliance with design specifications and legal requirements. For this reason, and due to the need to reconcile the requirements of the manufacturers and operators of industrial plants with those of the people working or living in the environment, the ability to make true, reliable measurements conforming to the applicable regulations is the main requisite for this type of measurement.

SOUND INTENSITY

The measurement of sound intensity makes it more straightforward to determine the **Sound Power** of a source, particularly as it dispenses with the costly and complicated installation of an anechoic or reverberant room.

SINT Technology offers this service in accordance with the latest standards, ie,:

ISO 9614-2 - Acoustics -- Determination of sound power levels of noise sources using sound intensity -- Part 2: Measurement by scanning



8 Measurement of gas emissions

Gas emissions are another parameter of fundamental importance for industrial machinery and plants.

SINT Technology has in-depth experience in measurement of nitric oxides (NOX), carbon monoxide (CO), carbon dioxide (CO₂), sulphur oxides (SOX), and particulate.

PRODUCTS

SINT Technology produces and markets two types of products:

- Measurement equipment designed, patented and produced by the company and marketed as a product line
- Equipment and software custom-built from basic models and therefore classified as prototypes or special products

Standard Products

This category consists of equipment that is designed, produced and distributed on the market by SINT Technology for making special measurements of which the company has in-depth knowledge, such as residual stresses, the drilling resistance of stone materials, the positioning of probes and data acquisition.

SINT supplies its products complete with the related software and is also able to provide assistance with operation of the equipment, training and updating of the software.

The products made by SINT Technology are marketed directly by the company or by partners such as HBM (in Germany), the distributor of MTS3000—Restan worldwide.

MTS3000—Restan

An automatic system for measuring residual stresses by the hole-drilling strain gauge method, in accordance with ASTM E837-13 standard.

The system consists of an optical and drilling device, an electronic control unit, a software to run the test and a software to process the results with several options and calculation algorithms.



DRMS Cordless



A portable system for measuring the drilling resistance of stone materials and mortars.

During the test, both rotational speed and penetration rate are kept constant, and the drilling resistance is measured through a precise load cell.

The system was developed for laboratory and field tests, and the results are expressed in numerical values and graphs showing the penetration force versus the drilling depth. Additional features include database of the tests and statistical

Other prototype and special products include:

- Data acquisition systems
- HW/SW systems for monitoring special tests
- Products for special applications
- Software programs developed to customer specifications.

DESIGN ENGINEERING

Design engineering of machinery and testing facilities

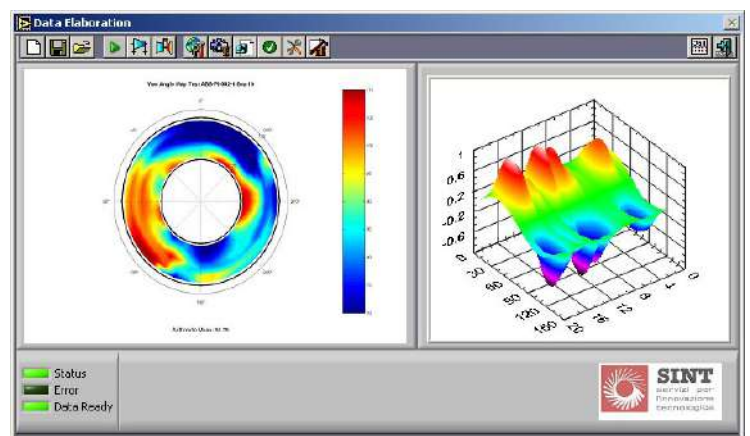
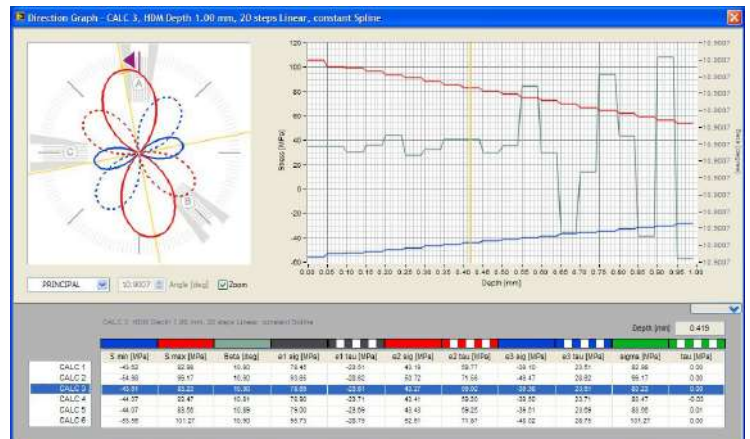
- SINT Technology provides **mechanical, electronic and software design engineering services for various applications:**
- Design of machine prototypes
- Design of plants and systems with sensor technology and acquisition systems
- Complete design of testing facilities for medium-sized machines and components (centrifugal pumps, valves, etc.) including conceptual design, process design, mechanical and electro-instrumental detail design, stress analysis, working drawings, selection of components.

Design and development of software

SINT Technology has long experience in developing integrated hardware and software signal acquisition and analysis systems.

Thanks also to well-established partnerships with leading multinationals operating in the field of data acquisition, the company delivers software design and **development services in the following sectors:**

- Software for acquisition, storage, presentation and analysis of machine and plant data. In particular, strain gauge analyses, rotor-dynamics, analysis of torque and torsional vibration, vibration analysis, environmental acoustic analysis, thermodynamic analyses, analysis of machine and plant performance
- Software for the supervision/automation of industrial processes, **with remote diagnostics**
- Design and construction of databases for storing supervision, testing and measurement system data
- Construction of drivers for electronic measurement instruments
- Calibration of sensors and measurement apparatuses
- Post processing and advanced data analysis, with automatic reporting



SINT Technology has a wide-ranged knowledge of development environments in order to be able to adequately meet customer requirements. The following development environments/languages are used: National Instruments LabVIEW, WAGO I/O -PRO 32, SQL, MatLab, Framework Microsoft .NET.

SINT Technology supports customers in all stages of a project, from drawing up the specifications to design and construction of hardware components and software, to the complete supply and subsequent maintenance of the system. The integrated hardware and software system can be totally tailored to the customer's requirements and specifications.



BORESCOPE INSPECTIONS



Video borescope inspections allow a machine to be examined without needing to be disassembled.

They can also be used for accessibility to hollow areas inside bends, such as in combustion chambers, or to examine the state of wear or foreign object damage on compressor and turbine blades.

Borescope inspections are an excellent means of conducting

predictive maintenance on machinery and plants.

They are principally used for:

- Gas turbines
- Axial and centrifugal compressors
- Combustion chambers



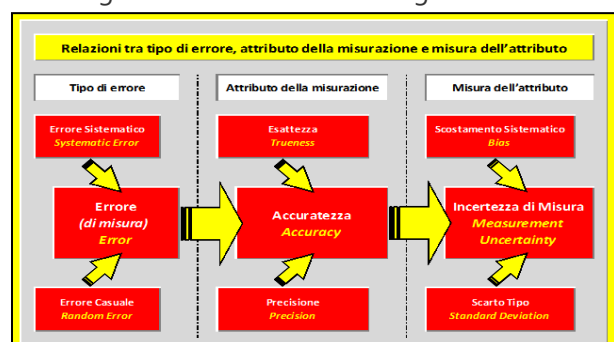
Emission Trading and Uncertainty of Fiscal Gas Measurements

Since introduction of the Kyoto Protocol to control the emissions responsible for climate change, SINT Technology has conducted annual uncertainty assessments related to the measurement of the thermal cycle fuel supply flow and steam flow rates in over 30 thermoelectric power plants across Italy. Evaluation of the uncertainty related to measurement of these flow rates enables the power generation process to be certified in compliance with the current, continuously evolving, complex European and national regulatory framework, both in relation to the fiscal measurement of gas and to calculation of the quantity of carbon dioxide emissions. Plant operators are required to give this information to the Ministry for the Environment in a CO₂ annual report. SINT Technology's support allows the content of the report to be validated (also establishing the efficiency of each plant with high reliability) and makes it possible to reconcile the aspects of environmental impact and economical operation.

The uncertainty of measurements is evaluated starting from the specifications of the individual instruments installed in a plant (as certified in the rated class values by the respective manufacturers) to arrive at establishing a degree of compound uncertainty relating to the whole measurement chain in the referred year. In the event of inaccurate calibration of one or more instruments, a sensitivity analysis is made to evaluate the consequent increase in uncertainty in relation to rated values.

With the expertise that it has established in these activities over the years, in addition to strengthening its leadership in metrology SINT Technology has developed a proprietary methodological standard of evaluation of uncertainties in the strategic energy business, which is particularly critical on the current world stage.

The approach of uncertainty evaluated as the "weighted average" of the range of operating conditions of a plant in one year of operation has been appreciated and supported over time by the leading accredited verifiers (DNV, Rina, Bureau Veritas) and has been adopted in the latest guidelines for regulation of emission trading.





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