SCS-EUROACOUSTIC

SCS 9002
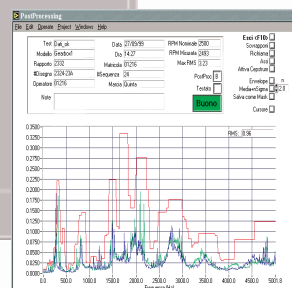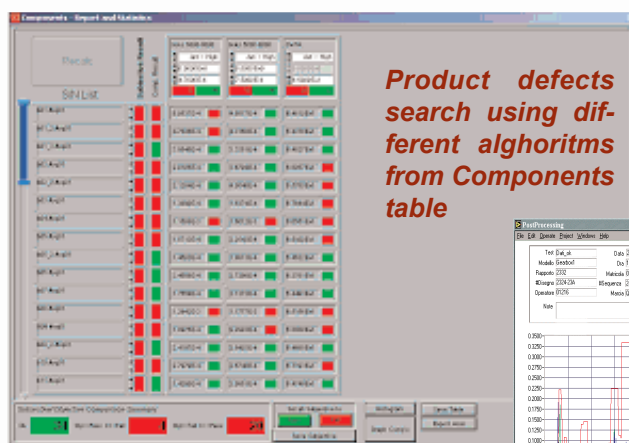
Quality Assurance and Diagnostic Control on Production Lines

A STATE OF ART AUTOMATIC SYSTEM WITH AUTO-LEARNING CHARACTERISTIC

Product defects search using different alghoritms from Components table

No operator intervention
Remote control: LAN, WEB
Client/Server architecture
Auto-learning
Unlimited defects list

BASIC FEATURES

Applicable to many different products
Production faults classification
Measurement flexibility
One Touch operations
Advanced Database
Wide range of mathematical and spectral functions
Automatic reference mask creation
Components table
Time-Frequency analysis
Ramp up/down detection
Orders tracking
Multichannels acquisition
Subjective judgement
Windows environment

Quality Control system

Production Line
Acoustic Measurements
Vibration Measurements
Other Dynamic Meas.
Conditioning Modules
OK
Static/Slow Meas.
Multichannels Acquisition Board
Digital Lines
Industrial Personal
Serial/Parallel
Line Controller (PLC)

OK
Store <F6>   Done <F10>   Analysis <F3>

QC EXAMPLES

Air Collectors (Magneti Marelli): QC process based on comparison between Measured and Theoretical Acoustic Mode of inner cavities, using special design excitation loudspeaker and measuring microphones.
Refrigerators (Electrolux): Complete Refrigerators are tested at the end of the production line using an accelerometer automatically attached to the Refrigerator body.
**Dishwasher** machines (Electrolux): Dishwasher machines are tested in a small reverberant room with a microphone system, the results are compared to the Acoustic power data previously certified in a standard room.
Electrical motors (Electrolux): Electrical motors for washing machines are tested on the production line with an accelerometer automatically positioned on the external stator pack, tests are performed on a variable run/up and in stationary rotating conditions. Each motor arrives in the test station on a pallet carrying identification codes. The system is reading the code and loads the corresponding measurement parameters and reference mask.
Injectors (Fiat): System at high sampling frequency (1 MHz), for transient analysis of: pressures, noise, current and acceleration of diesel engine injectors with Common Rail technology.
Security belts (TRW): Quality control of noise emitted by rolling movement of safety belts.
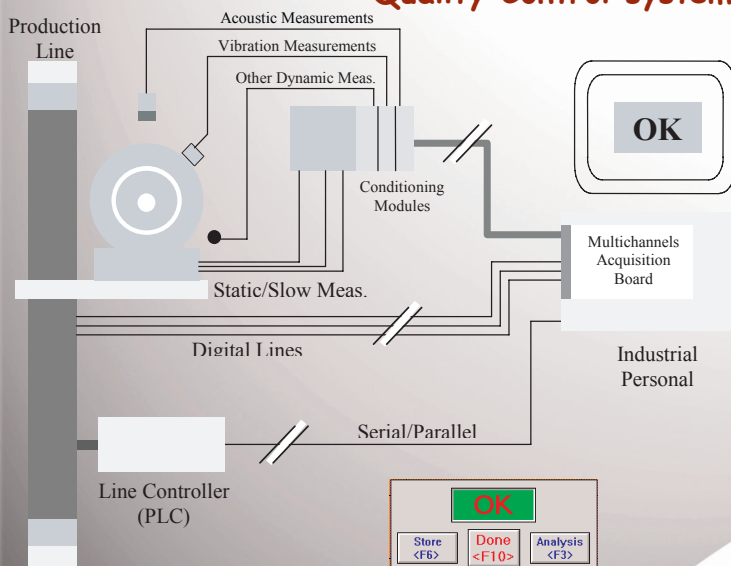
Gearboxes (Graziano, Ferrari, Iveco, Euroricambi, Iran Khodro): Automatic test of gearbox performed in run up order tracking, a complete test bench is also capable of driving the gearbox in a specific way, automatically changing shifts and controlling load.
Seats (Lear Corporation, Johnson Control): Squeak and rattling from automotive seats controlled using a test bench where the seat is excited with an electrodynamic shaker with random vibration controller in close loop, reproducing a PSD spectra taken from road measurements. The complete test system is placed in an acoustical insulated room.
Turbine blades (Ansaldo Energia): Automatic check of turbine blades resonant frequencies acoustically excited; frequencies are compared with predefined values within given tolerances.
Gas Valves (Sit la Precisa): Automatic control for defects in the open/close action of gas valve, using acoustic detection.
Automotive Electronic Devices - (Facet): Test on electrical continuity of high tension switches and other electronic components while artificially vibrated using electrodynamic shaker in close loop control.
Vibration absorbers (Integra - Fiat): Acoustic emission of car vibration absorber under fatigue test.
Power plants chimney (AEM Torino): Continous monitor of noise emitted by power plants chimneys in urban area
Carbon powder process (SNAM - Priolo): Continous check of carbon agglomerated parts in a supply tank, using acoustic detectors.

S.C.S.
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SCS 9002 Quality Control Overview

Applicable to many different products

The flexible architecture of this system allows its application to many different products, both for single components and complete assemblies. Typical applications: combustion and electrical engines, pumps, gearboxes, compressors, valves, etc.

Production faults classification

Each equipment is characterized by a specific set of possible production faults; so, many of them have a peculiar effect on the acoustic or vibrational behaviour; thus is possible, on the basis of technical knowledge and/or statistical investigations, to identify and classify every fault in terms of the specific measurement characteristics.

This approach transforms the quality assurance technology in a valuable design tool, because of the implicit capability to continuously increase a very useful database, for discovering the production weaknesses and take the right decisions for enhancing the production reliability.

Measurement flexibility

The SCS-9002W system can be configured for vibrational and/or acoustic measurements. A fundamental feature is also the capability to acquire simultaneously dynamic signals (like acceleration, sound pressure, etc.) and slow signals (like temperatures, pressures, etc.); monitoring slow signal is often essential in order to precisely correlate the dynamic behavior of the component with its particular operating conditions. As a standard PC version the system is able to acquire from 1 dynamic channel up to 16 static or dynamic channels: all the hardware components are automatically configured and they do not require any external action.

One Touch operations

The traditional measurement techniques in the vibration and acoustic field, using FFT analyzers, require specialized engineers in order to understand the methodologies and correctly use the instrumentation. A complete measurement stage passes through many steps, like hardware and software setups, data acquisition, analysis, and just an acoustician can maybe understand the results.

The SCS-9002W innovative approach, thanks to its internal skill, is able to automatically execute all the required activities, with no human intervention; the One Touch philosophy is today a reality for the quality assurance field: each system is customized with the goal of the maximum simplicity.

On a production line the system automatically executes all the quality assurance tasks, exchanging informations with the PLC (Start test, Stop, Identification codes, Test result, etc.), transferring data through serial or parallel interfaces, checking the transducer positioning, and so on.

Of course the specialist or the supervisor, if necessary, can interact with the system, for sophisticated investigations.

The quality assurance technology based on acoustic and vibrational measurements is in many cases the ideal solution for the mechanical industry, in terms of reliability, flexibility, time and money saving.

Thanks to his significant experience in the quality assurance field, the SCS-9002W represents an innovative system with a set of hardware and software components easily suitable for a wide range of quality assurance applications.

In the quality assurance field, no unique algorithms can be defined, in order to extract from raw data the right informations, really useful for discriminating good and faulty components; only a case by case approach, based on experience and experimental tests, can provide the best measurement type and the best calculation.

For example, if bearings faults are interesting, envelope analysis can be suggested, for rotating equipment, tracking filters can easily extract synchronous components, transient or impulse vibrations can be investigated with Wigner-Ville algorithm, etc.

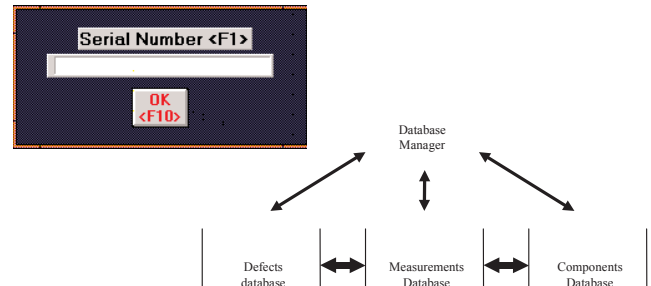The SCS-9002W software has a large library of mathematical, statistical and signal processing functions:

FFT based analysis, Power Spectra, Cross-spectra, Transfer Functions, etc.
Order tracking and harmonic post-processing.
Cepstrum analysis.
Octave analysis (full, 1/3, 1/12, ect.).
Wigner-Ville analysis.

Database

The foundation of quality assurance is the database: the SCS-9002W software provides a powerful database management, structured in three parts:

Components Database: every component typology must be characterized for the quality assurance needs; the system is able to automatically retrieve all the useful informations (serial number, measurement points, tolerances, etc.)

Measurements Database: the system allows the automatic, or on condition, data storing option; each datafile (narrowband or 1/3 octave spectra for instance), has a header containing all the related informations (S/N, test type, results, etc.). With a statistical approach it is than possible to continuously check the production behavior, optimizing the quality assurance process.

The minimization of the two possible quality assurance mistakes (accept faulty components or reject good components) is obtained enhancing the statistical confidence, thanks to the increasing of the database size.

Defects Database: if active, the defects classification allows, as additional result of the quality assurance process, the creation of a precious database, both for the production line supervisor and for the designers and the management.