Analyser®

AI software for Industry 4.0

The Analyser® sustainably ensures **robust products & stable processes** and **predictive maintenance** with the Robust Design method.
The **patented AI algorithm** creates defect analyses and predictive models even with small samples, reducing scrap, rework and warranty risks.

CONTECH
Software & Engineering GmbH

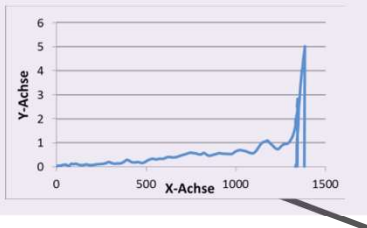
Supported by:

Federal Ministry
for Economic Affairs
and Energy

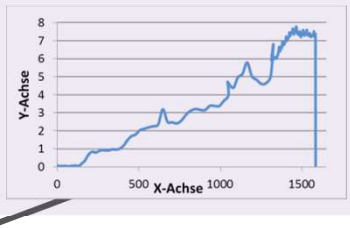
on the basis of a decision
by the German Bundestag

Overview: The functionality of Analyser®

Product and process curves from sensor data



Bauteil-Nr.	Merkmal X1	Merkmal X2	Merkmal X3	weitere...
10001	1200	12039,93	48,12	
10002	1176	11750,58	48,52	
10003	1230	11979,17	48,47	
10004	1206	12019,68	48,50	
10005	1212	11979,17	48,08	
10006	1188	11747,68	48,42	
10007	1170	11770,83	48,48	
10008	1212	11979,17	48,47	
10009	1224	12051,50	48,34	
10010	1230	11345,49	47,97	
10011	1218	11319,44	48,13	
10012	1272	11388,89	47,93	



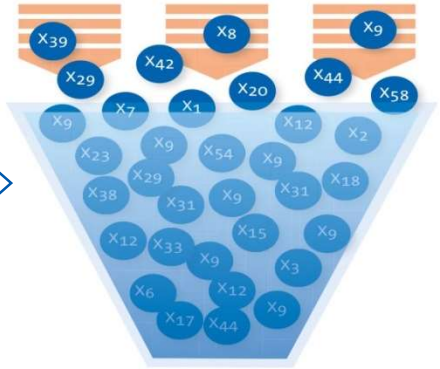
Analyser®

Our **patented**, statistical **algorithm**

Self-learning based on **Artificial Intelligence AI**

statistical
fingerprint

≥ 200 influencing variables X_i are possible



Controlling the relevant **influencing variables**

Multiple non-linear **functions**

$Y = f(X_i)$

X9 X54 X6

Significant influencing variables X_i

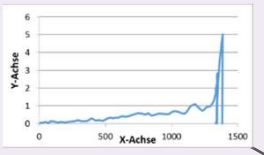
Failure types → cause-effect relationships → root causes → measures / solutions + recommendations for action + process control in real time

Overview: The advantages of Analyser®

Input

(Database / ME-System)

Process and product curves from sensor data



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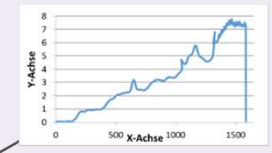

Our **patented**, statistical **algorithm**

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Module
Production Assistant

- The 24/7 on-site optimization for production
- Analyses all **(sensor-) data** and recognizes **failure types** from product validation and process curves **fully automatic** and **in real time**
- Offers causes of failures, **solutions**, **measures** and **recommendations for action**
- **Supports** your employees to **solve problems**, reduces **failure rates** and **project duration**
- The system for **preventive and reactive failure analysis** for robust products and processes

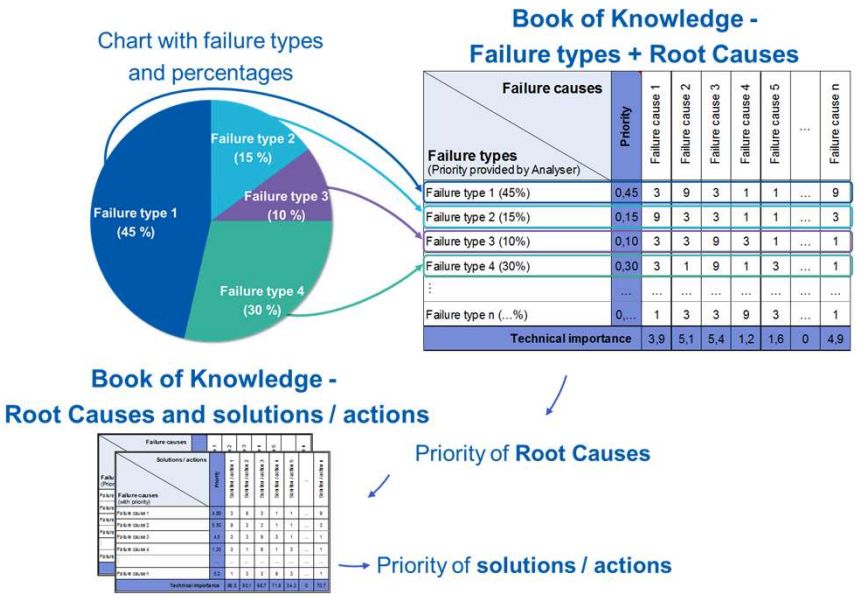
Module
Transfer Function

- it detects unknown **cause-effect relationships** between requirements and influencing variables,
- Analyses single values, curves and areas
- **Controls** and **optimizes** the **product** and **process parameters** based on the cause-effect relationships
- Provides a **real-time** fulfilment of requirements and creates a **robust product** and **process design** through optimal **parameterization** and **tolerancing**
- Processes **small series of measurements** and **large amounts of data** in **prototype** and **series production**

Increases **resource efficiency** through **failure prevention** in the areas of rework, warranty costs, warranty risks, material consumption, reject products, production and energy costs

Benefits of Analyser®

- » **Automates** a **proven practice** in determining the cause-effect relationships for **robust products** and **stable processes**
- » Requires a **very little** Teach In / machine learning expenditure
- » Reduces over **50% of the failure / rework costs** and **warranty risks** even at steady series productions within 6-9 months
- » **Shortens** the project duration for process optimizations from the usual 2-3 months to only **8-10 hours**
- » Saves **expert knowledge** about products and processes in terms of failure types and cause-effect relationships in a transparent way, **accessible** and **usable for everyone**



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It also creates an important contribution in **securing** new **products** and their **manufacturing processes**

- » Ensures **functional** and **robust products** and **processes**
- » Ensures **quality** and **reliability** of the products
- » Verifies **reliability** & **durability**
- » Automatically ensures **testing** and **control**, statistical process control

Applications for Analyser® (Excerpt)

As soon as data is available, **all product validation & process curves** and **sensor data** can be processed in the Analyser®, e.g.:

Screw joints

» Torque curve [Nm] over angle of rotation [°] with tightening strategies in several stages

Pressing processes

» Force [N] by way [mm]

Acoustics / NVH & vibration issues

» Vibrations, NVH issues (sound pressure level [dB] by number of rotations [rpm])
» Acoustics and noise optimization at power trains
» Sporadic noise issues at e.g. chassis & damper elements

Control & Control engineering products / SMD Lines

» Absorption curves / angles of radar sensors for autonomous driving systems

Hysteresis loops

» Materials engineering: stress-strain diagrams
» Valves: Force [N] by way [mm] at certain waypoints and F_{max}.
» Control engineering

Component constructions

» Adhesive, cohesive and peel forces = f (viscosity, temperature, width / height, etc.)

Plastic injection molding

» Pressure [Pa, bar, psi] by time [s] or way [mm]
» Temperature [°C, °F] by time [s] or way [mm]
» Optimization of the open / closed loop control technology

Extrusion of plastics / rubber

» Profile geometry, hardness, force-elongation coefficient = f (Xi)

and many more…

5 Steps to start the Analyser®

Production and assembly processes

Digital monitoring and storage of process parameters and their curve characteristics.

Data interface, user interface

Flexible data interface to import curve data (online or via database). Graphical user interface to display curve characteristics with their individual parameters.

Standard interface to standard sensor data and controls: Analyser® ⇔ MES system

Book of Knowledge

Stored causes of failure, recommended measures and solution proposals to fix the failures (optional).

Effort: about 2 days for start filling

Teach-In process

One-time storage of curve specific expert knowledge for different failure types or other irregularities.

Effort: 10 - 20 min per new job sequence

Root cause analysis

Automated analysis of the entire input data and identification of the occurred failure types. Graphic presentation of the results with failure type percentages and prioritized causes and measures / solutions (optional via Book of Knowledge).

Real time: 1 - 2 sec. from transmission of sensor data, up to presentation of failure types + measures

Implementation of Analyser®

- » **Practical**, client-based **installation** at the place of value creation.
- » No extensive, company-wide software-roll-out necessary.
- » Installation and integration into existing database systems / systems for sensor data recording usually in **less than a week**.
- » Only about **2-3** man-days are required for the initial filling of the knowledge database, because after it the Analyser® saves the expert knowledge in a self-learning way.
- » Afterwards, the **first projects** and work sequences can be analysed and optimised **by your employees.**

Do you have any questions or do you need more information?

We are glad to advise you in detail on your topics and projects.

Just contact us and visit us on our homepages:

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Analyser® for Robust Design: www.contech-analyser.de

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