PREDICTIVE INTELLIGENCE Solution for

Predictive Quality Optimization in Production

Avoid Reduced Quality and Discover Disturbing Factors

Excellent production quality is the figurehead of each production company. Consequently, often, time-consuming testing methods are executed for critical production steps. They normally cover only random samples because of involved time and costs. For example, in process industry, quality of cement powder and interim products is measured in one hour frequency. Automotive suppliers execute tests on high frequency production steps only for a small one-digit percentage range.
Often, low quality is not detected. This causes problems in further processing or even leads to recalling of products.

Key Benefits

Self-learning Artificial Intelligence realizes 100% test coverage for quality assessments due to intelligent data analytics. Complex causes for minor quality are detected early in advance. Thus, production processes can be improved sustainably. Machine operators receive recommendation for optimal achievements. Or machineries are controlled automatically in the best way without manual user interaction.
The following table shows the four levels of predictive quality optimization. Although those levels show a hierarchy, each optimization level is independent and achieves value add, individually.

Optimization Level	Objective	Problem	Value Add
# 1 Quality Assessment	Discover quality of each relevant production process, i.e. executed by robots	Checks are time consuming (i.e. ultrasonic). Therefore, only a fraction is analyzed randomly.	• Quality checks for 100% of production steps of relevant robots • Manual ultrasonic is only executed on those quality assessments which are near the borderline. • Significant cost reduction of quality tests and at the same time, 100% test coverage
# 2 Quality Prediction	Predict Quality KPIs for (longer lasting) production steps, i.e. machining	After execution of a production step, quality is visible.	• Quality KPIs of critical production steps are predicted during processing of that production step. • Interrupt processing if minor quality is predicted. This saves production time and money (material, energy, machinery usage).
#3 Root Cause Discovery	Discover reasons for bad quality, i.e. at automotive supplier	Although production is exactly the same (machinery, calibration, supplier material, …), sometimes, some machineries deliver bad quality.	• Discovering complex disturbing factor combinations • Sustainable adjustment of production process to avoid low quality.
#4 Predictive Maintenance	Take early counter measures before product is produced with low quality .	Wear and tear causes low quality. Often, wear and tear is noticed when produced quality is bad. Then, ad hoc maintenance activities are necessary to stop low quality production.	• Discover wear and tear before it actually happens • Recommend maintenance activities early in advance • Execute maintenance when it fits best in production process • Produce high quality.
#5 Predictive Machinery Control	Calibrate machinery automatically in such a way that correct quality is produced, always .	Especially in batch changes, it takes time to set correct machinery settings. I.e. for cement mills, often, correct quality is realized after 1 hour.	• Hardly any minor quality is produced due to automated machinery calibration. • Please note: Instead of automation, recommendation to operator can be given.

Features

Dynamic pattern discovery
In highly complex and dynamic data, hidden and multifaceted data patterns are discovered. High complexity can mean big data/data lake, but also hardly any data/gaps in data.
Benchmarks have proven that PREDICTIVE INTELLIGENCE reaches significant more accurate predictions in complex and dynamic data than state-of-the-art methods like Deep Learning, Neuronal Networks, Support Vector Machine, Regressions, …
In addition, often, those methods deliver satisfying results on learned data, but are not reliable on un-learned data. PREDICTIVE INTELLIGENCE realizes equally good results on untrained data.

Anomaly detection
Complex data patterns are found which happen in similar or changed ways before minor quality is produced. Those changing patterns can be developing over weeks or months or just within seconds or minutes. PREDICTIVE INTELLIGENCE detects anomalies and assesses them for criticality.

Influencing factor discovery
Available data is analyzed for their influence to cause minor quality. In this way – even out of data lakes – significant factors are discovered. Transparency leads to optimized process re-design. In addition, sensors are optimized because attention is paid to relevant sensors, only, instead of gathering as much data as possible.

Quality assessment
Automated quality checks

Quality prediction
Minor quality is discovered early.

Root cause analysis
Disturbing factors are discovered, early. This transparency enables sustainable process improvements.

Predictive maintenance
Future machinery problems are discovered. Thus, machinery is always meeting quality requirements and products are always of high quality.

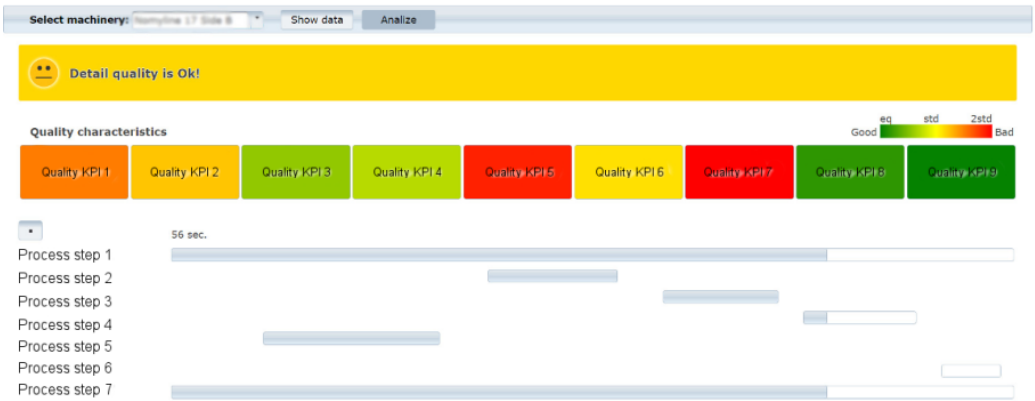
Predictive machinery control
Complex algorithms simulate variants in machine settings and control machinery in a predictive way, to realize optimal quality. Instead of automatic machinery control, recommendations can be given to machine operators.

Self-learning: Manage changes over time
Production processes are not static. Changes happen again and again, for example, production lines` utilization is changed, production items are changed, … This leads to high number of process variants, like heavier or lighter machine assignments, etc.
Self-learning algorithms understand dynamics of those changes and adopt analyzed data patterns automatically.
Thus, there is no need to engage Data Scientists regularly to adjust mathematical models to changed reality. PREDICTIVE INTELLIGENCE realizes those adjustments automatically.

Self-learning: Enable scalability
In state-of-the-art methods, Data Scientists might be required to modify mathematical models for each individual machinery instance.
However, PREDICTIVE INTELLIGENCE learns the individual context of each instance, automatically. Thus, no Data Scientist has to adjust mathematical models for individual machinery instances.

Technical flexibility
PREDICTIVE INTELLIGENCE has a flexible architecture. It can be run on Linux or Windows, can use SQL or SAP HANA© and is GPU-enabled for high performance.
It can be easily integrated into your IT architecture (cloud, on premise, edge), either with own user interfaces, or as analytics core to send results into your existing monitoring system.

Project approach
- Phase 1 – Scoping
  Prioritize critical processes and machinery and get transparency on available data
  Phase 2 – Analytics concept
  Get assessment on available data (data quality, analytics potential, …), predict quality, discover influencing factors, detect anomalies and control machinery.
- Phase 3 – Analytics implementation
  Integration in operative environment, field test, roll out and go live.



About IS Predict GmbH

IS Predict GmbH helps organizations to get the best business value out of digitalization and data analytics. Self-learning Artificial Intelligence solution PREDICTIVE INTELLIGENCE enables customers to optimize their processes in a predictive way – avoiding inefficiencies before they occur.