papers for the future

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Industry 4.0 at a paper machine

Koehler Paper Group

- Koehler Paper Group – one of the very few independent and family owned paper groups in Europe

- 7 paper machines and 1 board machine at 4 locations

- Sales Volume 2014:   500.000 t

- Sales Value 2014:   650 Mio. €

- Employees 2014:   1.694

Papierfabrik August Koehler SE Oberkirch

Koehler Kehl GmbH Kehl

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Koehler Paper Group - Products

„Industry 4.0" for the Koehler Paper Group?

Requirements ➜ production process infromation

| automated operating and machine data logging | relate to the economic documents | easy and fast analysis |

+

Advantage of Industry 4.0

| real time information | predictive quality |

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Prototyp Project

„Production Analysis & Quality" (PAQ)

feasible	viable	desirable

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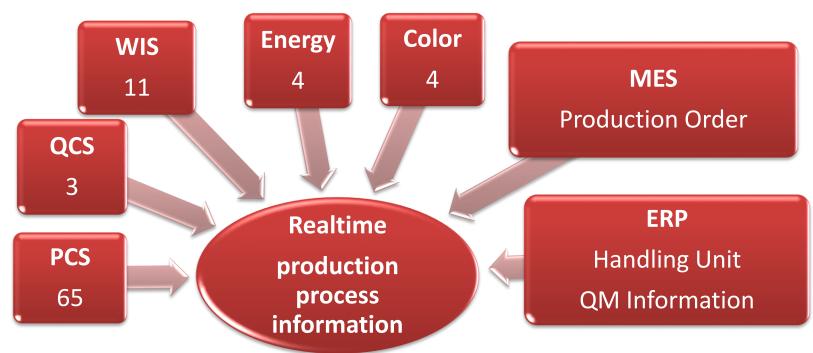
Paper Machine 6
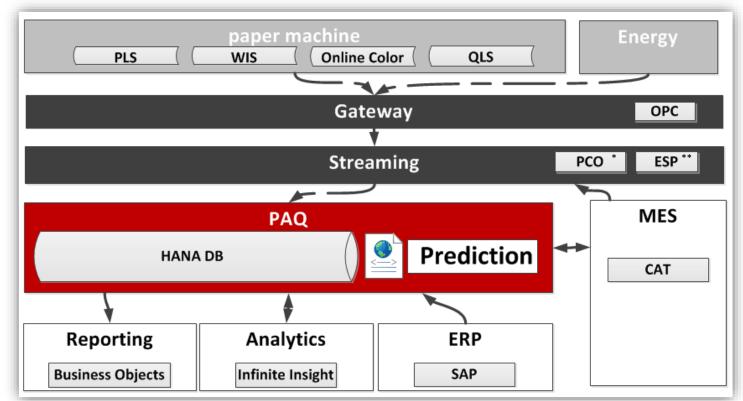
Related Systems

87 parameter values in a 3 second intervall

WIS
11

Energy
4

Color
4

MES
Production Order

QCS
3

PCS
65

Realtime production process information

ERP
Handling Unit
QM Information

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Related Systems

4 Month Data

production process values	• 320 Mio.
Handling Units	• 5 Tsd.

today

87 parameter ➔ data factor 64.000

planed

500 parameter ➔ data factor 370.000

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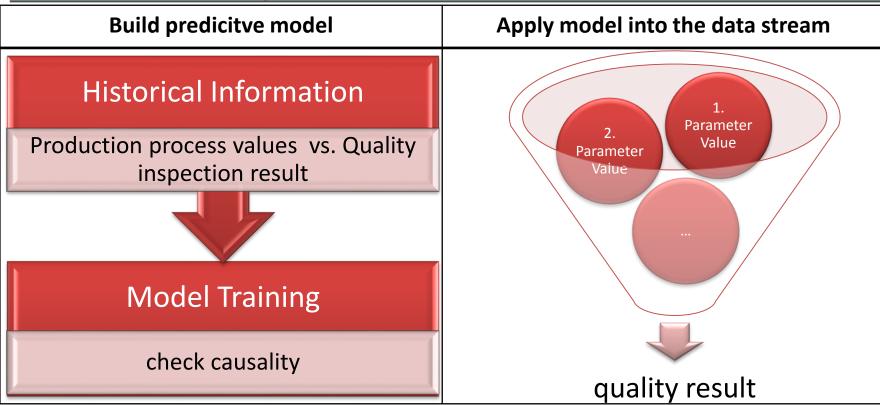PAPER GROUP

Predictive Quality?

correlation
- **What parameter influences the target?**
- **How intensive is the influence ?**

prediction
- **What will be the target result at the actual parameter setting?**

Predictive Quality?

Build predicitve model	Apply model into the data stream

Historical Information

Production process values vs. Quality inspection result

Model Training

check causality

1. Parameter Value

2. Parameter Value

…

quality result

Why Predictive Quality?

with in-process-controll
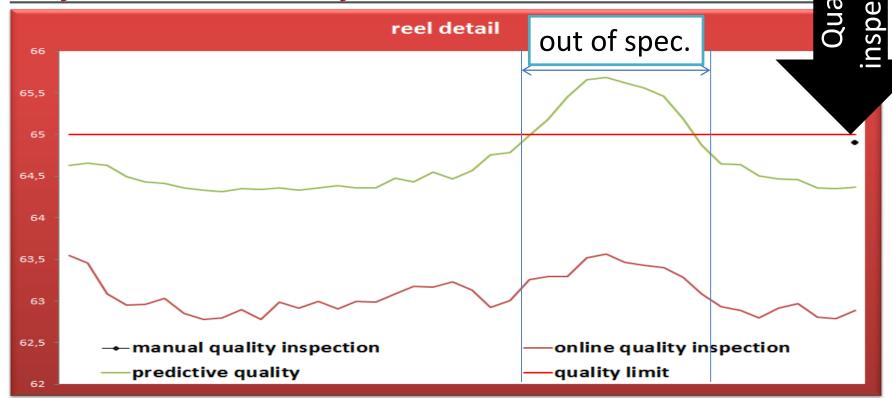
higher precision

without in-process-controll

realtime in-porcess-controll

Why Predictive Quality?

out of spec.

reel detail

- manual quality inspection
- predictive quality
- online quality inspection
- quality limit

Quality inspection

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There is more in Predictive quality!

correlation
- **What parameter influences the target?**
- **how intensive is the influence ?**

prediction
- **What will be the target result at the actual parameter setting?**

simulation
- **What will be the target result when the parameter setting is changed?**

optimization
- **How to adjust the parameter setting to reach the target result?**

Feasible

systems

all systems are connected and working

improvement & expandability

continuously

know how

interdisciplinary team

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Viable

setup time

less standby time for quality information

scrap reduction

continuous process monitoring

customer satisfaction

continuous quality monitoring

ressource usage

inprocess comparison with the best process

Desirable

operational availability

the operator stays in control

data security and information integrity

we meet our company standards

reliability of results

all analytic results are recorded for verification

Conclusion of „Industry 4.0" for the Koehler Paper Group

➢ define your own „Industry 4.0"

➢ remain the process-control at your operators

➢ the value of prediction is not predictable

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