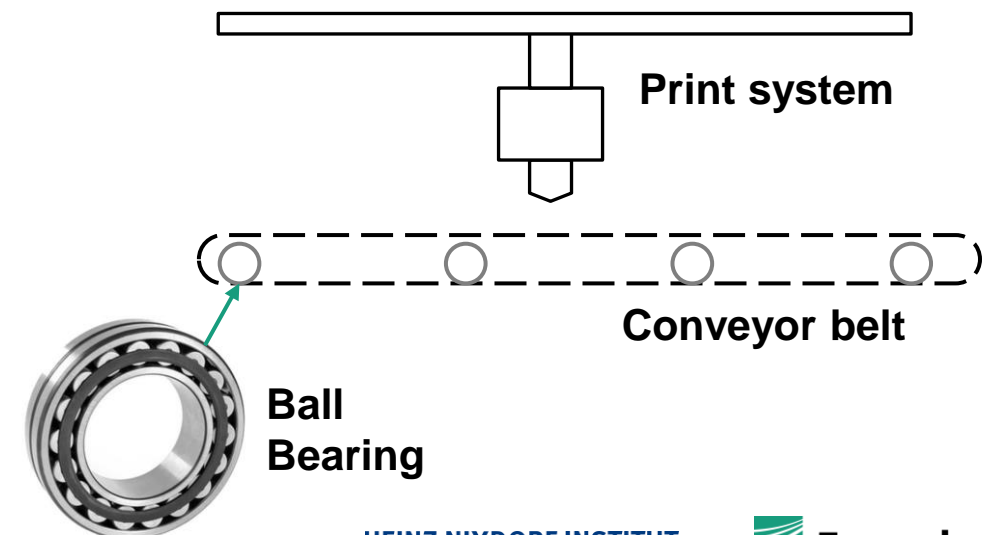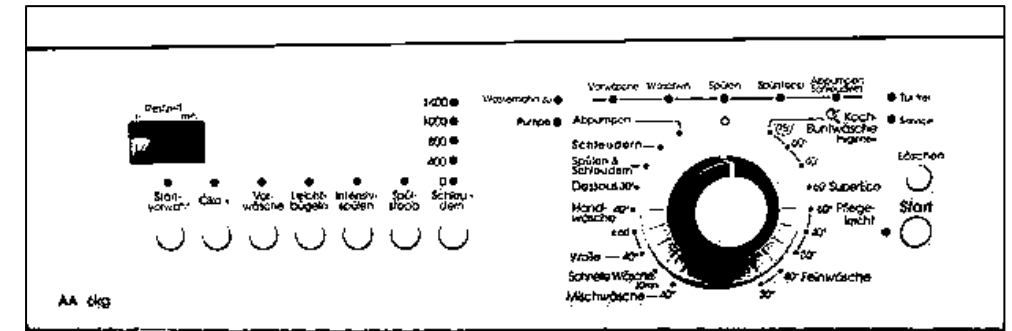# Kruse GmbH: Detect Product Faults with a Smart Quality System
Use Case Description

Kruse GmbH is struggling with increasing quality problems and inefficiencies in maintenance in production of their highest-selling product, the washing machine. The front panels are particularly affected by the quality problems. Embossing with subsequent printing by a stamp results in a reject rate of 5-10%. Another problem is the frequent stoppage of the conveyor belts. This has resulted in a very expensive regular replacement of the bearings.

After consultation with an engineer, it is suspected that the vibrations of the ball bearings in the conveyor belt are related to the quality condition of the product being manufactured. Vibration data with corresponding time stamps are recorded by a Machine Database, historical data is available in the MES System. In addition, there are about 1500 production logs in the ERP System that show which product was manufactured at which time and the quality state (ok, nok = not ok) of the printing on the products is known from the quality logs in the QMS.

Print system

Conveyor belt

Ball Bearing

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Kruse GmbH: Detect Product Faults with a Smart Quality System

Task and Dataset Description

Task: Help the Kruse GmbH and develop a monitoring system, that identifies the quality of the printing on the product using the historical vibration data and the quality and production log-data.

Description of the data set: There is data for one bearing with 2 acceleration sensors. The data set consists of individual files that are 1-second vibration signal snapshots recorded at specific intervals. Each file consists of a time series with 20.480 points at a sampling rate of ~20 kHz. The file name indicates when the data was collected. Each record (file) represents a production process and a corresponding product (row in production or quality log respectively)

Vibration measurements

	Sensor 1	Sensor 2
0	-0.234	-0.132
1	-0.254	-0.142
2	-0.144	-0.317
3	0.032	-0.161
4	-0.173	-0.222
5	-0.137	-0.054
6	0.051	-0.195

production log

	datetime	product_id
0	2003.11.08.18.01.44	P3.2.0500
1	2003.11.18.03.52.30	P3.2.0501
2	2003.11.21.23.46.56	P3.2.0502
3	2003.11.21.20.36.56	P3.2.0503
4	2003.11.16.02.28.46	P3.2.0504
5	2003.11.22.00.06.56	P3.2.0505
6	2003.11.24.19.07.32	P3.2.0506

quality log

	product_id	quality
0	P3.2.0500	iO
1	P3.2.0501	iO
2	P3.2.0502	iO
3	P3.2.0503	iO
4	P3.2.0504	iO
5	P3.2.0505	iO
6	P3.2.0506	niO

Radial Load

Bearing

Drive belt

Accelerometers

Motor

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