



An Inspection System for Pharmaceutical Glass Tubes

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Industrial Scenario

Gerresheimer AG

Leader in packaging products for medication and drug delivery

Headquarter in Dusseldorf

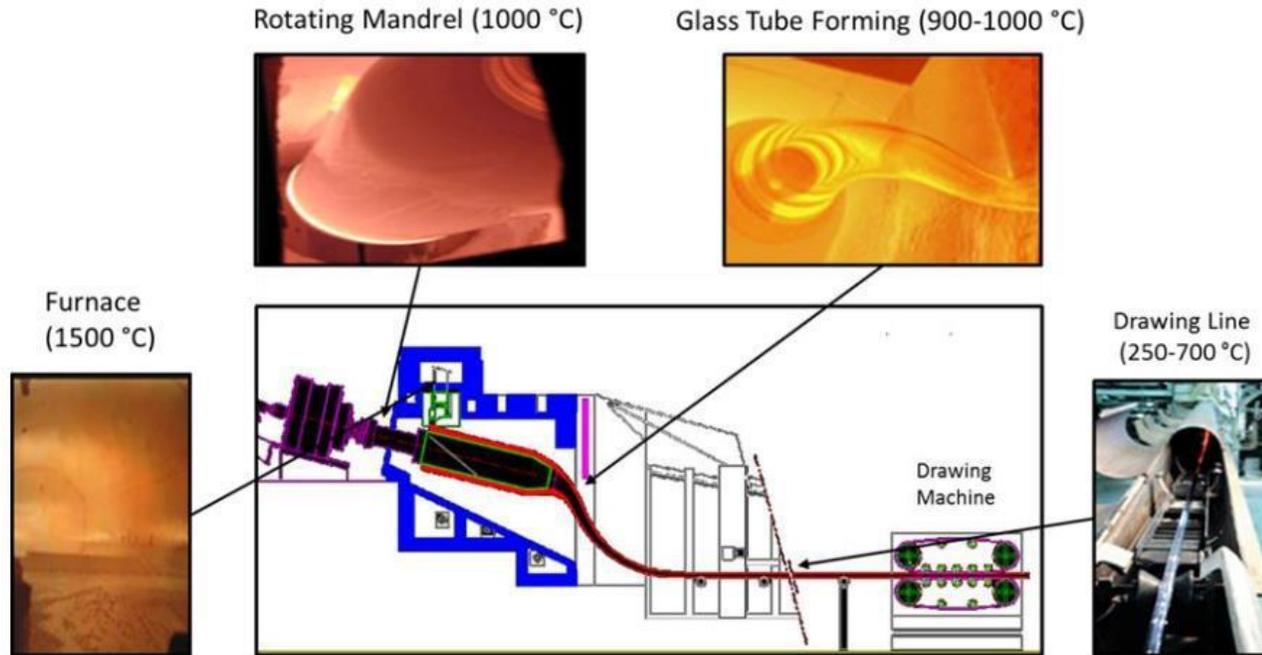
42 settlements in Europa, Asia, America



Revenue: € 1,377 Bilion

Number of employees: 10.686

Industrial Scenario



Silica sands are:

- Stored
- Heated
- Melted
- Rotated and shaped
- Cooled and solidified

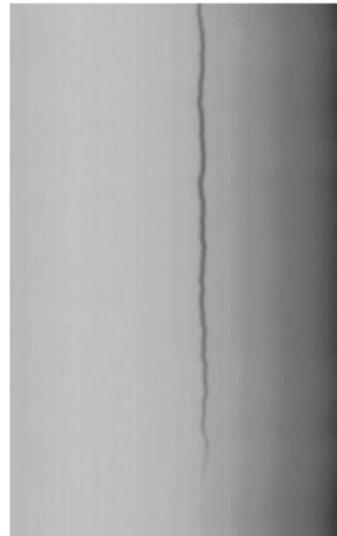
Speed Production: 4 m/s – 24h/7d

Focus on problems

Blobs (impurities)



Air-lines



Small defects can cause big problems:

- Broken final product
- Contamination for pharmaceutical products
- Economic losses for provider

Over than 40% of glass is discarded during quality checks

Gerresheimer in 2014 has lost more than 10 millions of dollars for delivering of packages that don't comply with the quality requirements of the customers

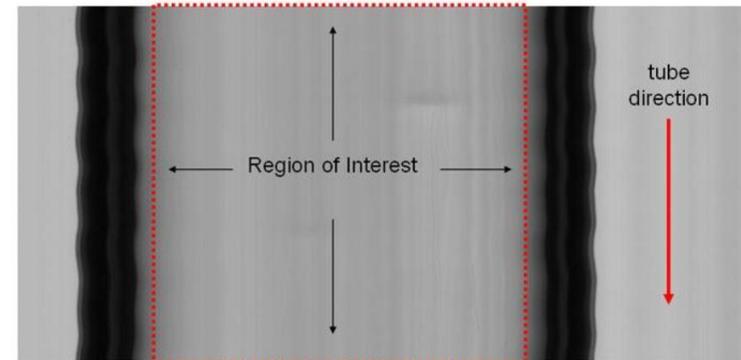
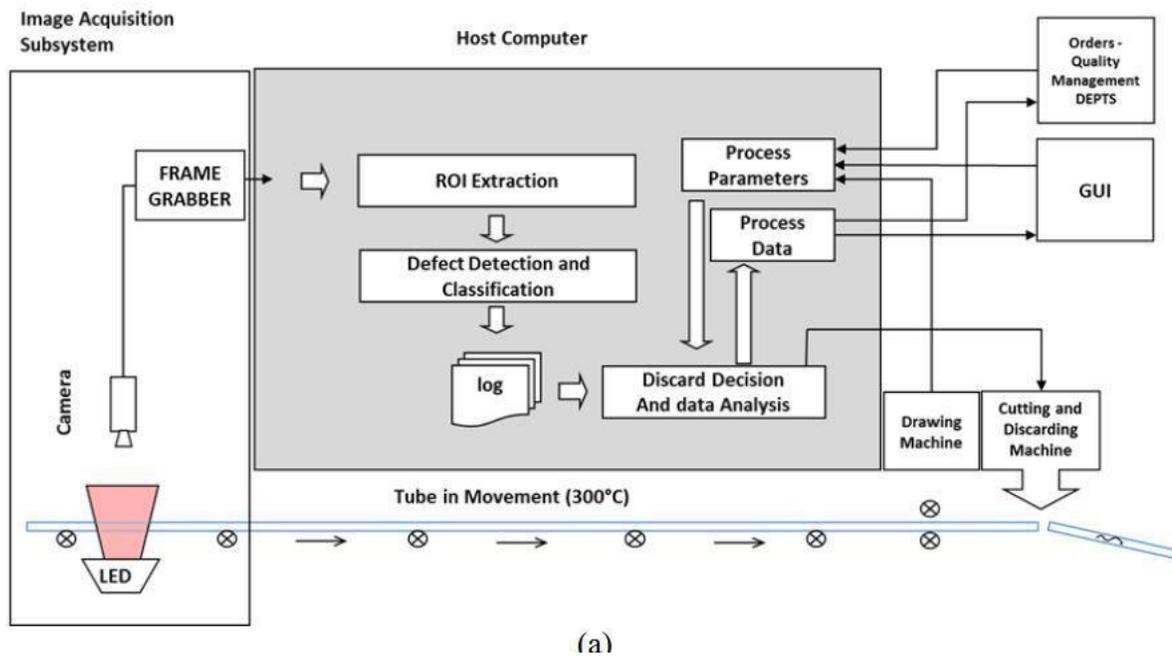
State of the art

Human Operator

- Unconstant performance
- Bad accuracy
- Not objective evaluation
- By sampling checks



Proposal Solution



Production and quality check phases are performed simultaneously

Performance problem

Scenario:

Speed Production: 4 m/s

Linear Camera Sample Rate: 8 Khz

Acquisition time of each frame of 1000 lines: 125ms

Costraint:

Elaboration time < Acquisition time

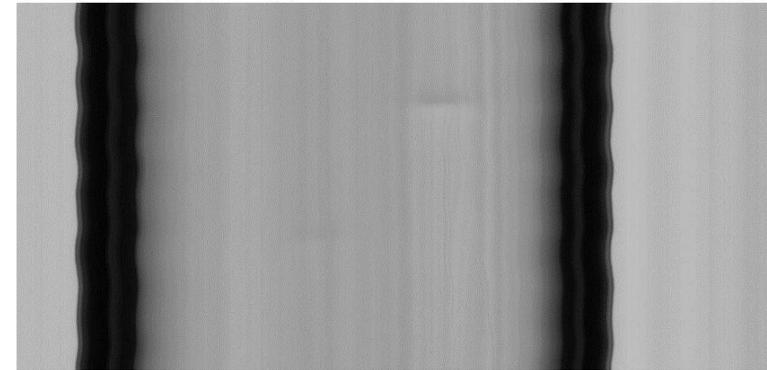
Consideration:

Increasing of speed production or improving accuracy
=> smaller elaboration time

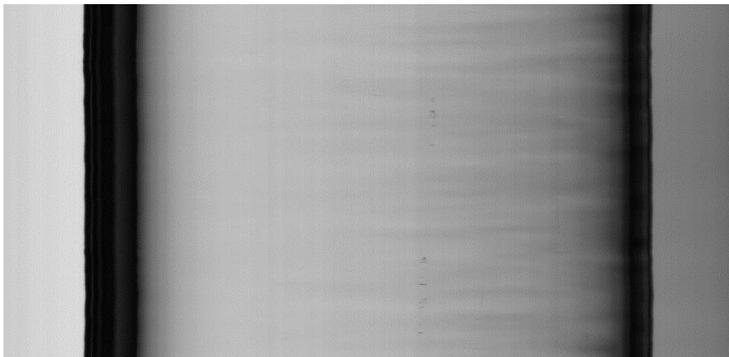
Acquisition Problems



Oscillation



High local contrast



Bad light condition

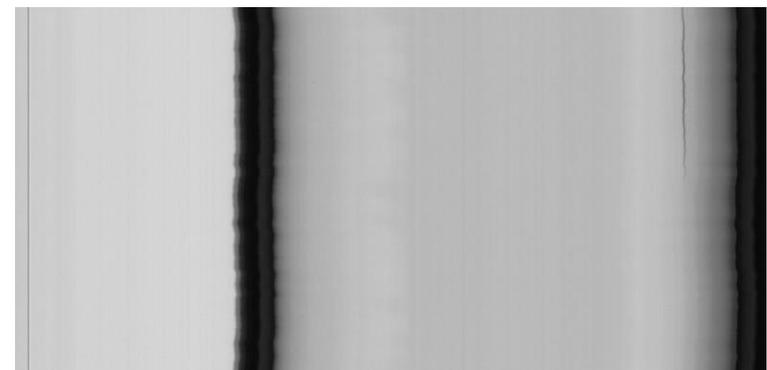
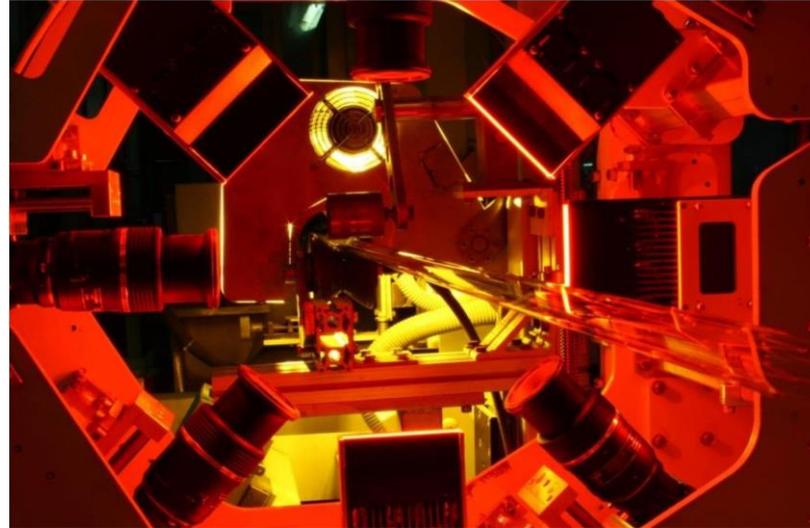


Image noise and dust

First Implementation



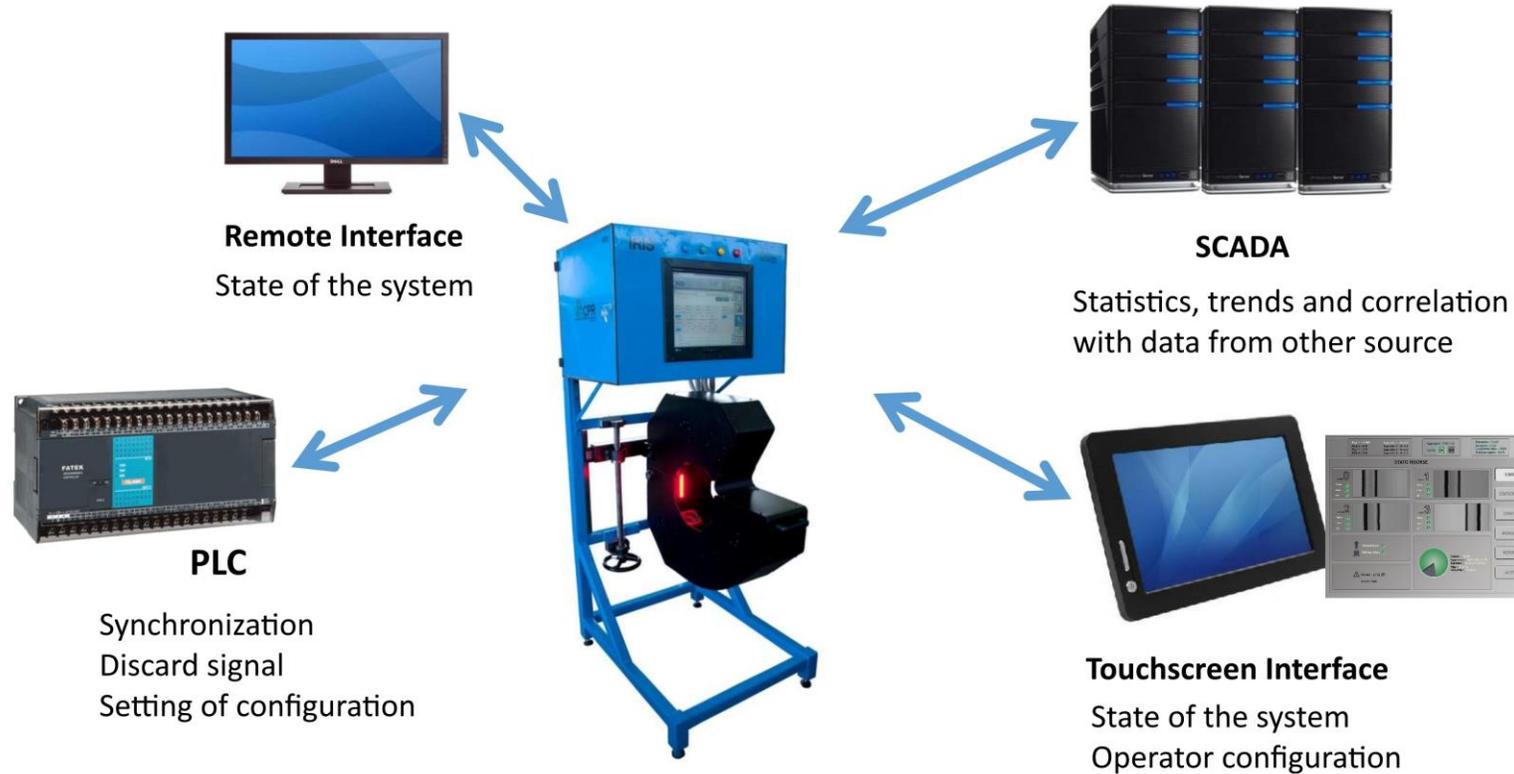
- 3-cameras for acquisition
- Data collections
- Useful only for testing

Final Machine



7

Final Machine



Future Works

Next Steps

- Exploration of embedded vision system
- Heterogeneous Software System based on CPU/GPU parallelism.
- Parallel execution of each subsystem software
- Implementation of more efficient and faster detection algorithm

Bring knowledge in other fields

- High precision mechanical manufacturing



Thank you
for your attention

QUESTION

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