



Update on Maintenance Best Practices from Europe & Industry 4.0 in Pelletizing

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Innovative Operational Approaches Available to the Pellet Industry's Early Adopters

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**ALL THINGS
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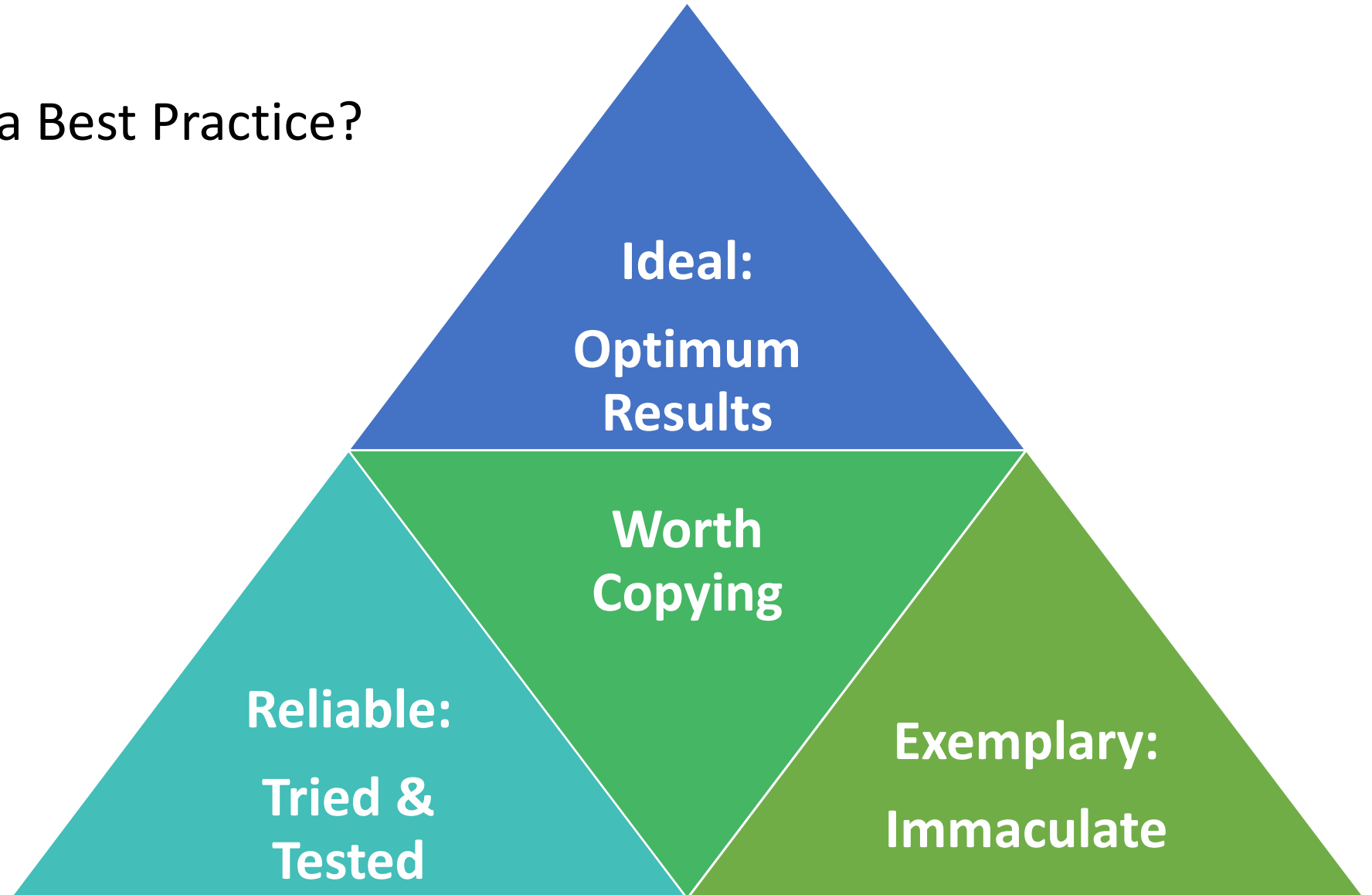
Agenda

1. Maintenance Best Practices
 1. The Road so far
 2. Before the Pellet Mill
 3. Pellet Mill
 4. Other Aspects
2. Industry 4.0 in Pelletization
 1. What is it?
 2. How to in a Pellet Plant
3. Conclusions



1. Maintenance Best Practice

What defines a Best Practice?



1.1 The Road so far

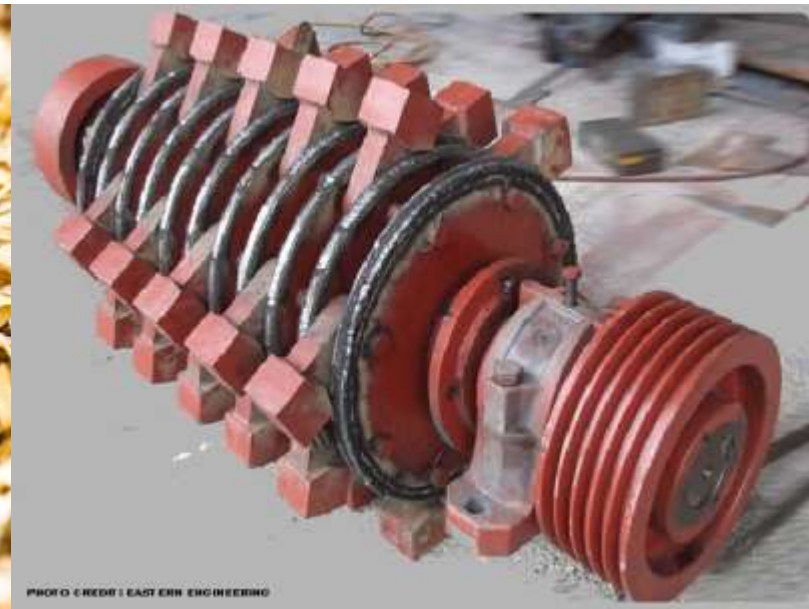
Best Practices we have seen so far:

- Quality checks for spare parts
- In-house refurbishing of rollers
- Pre-lubrication of bearings
- Ceramic grease

1.2 Before the Mill

Producing pellets is more than just operating a pellet mill.

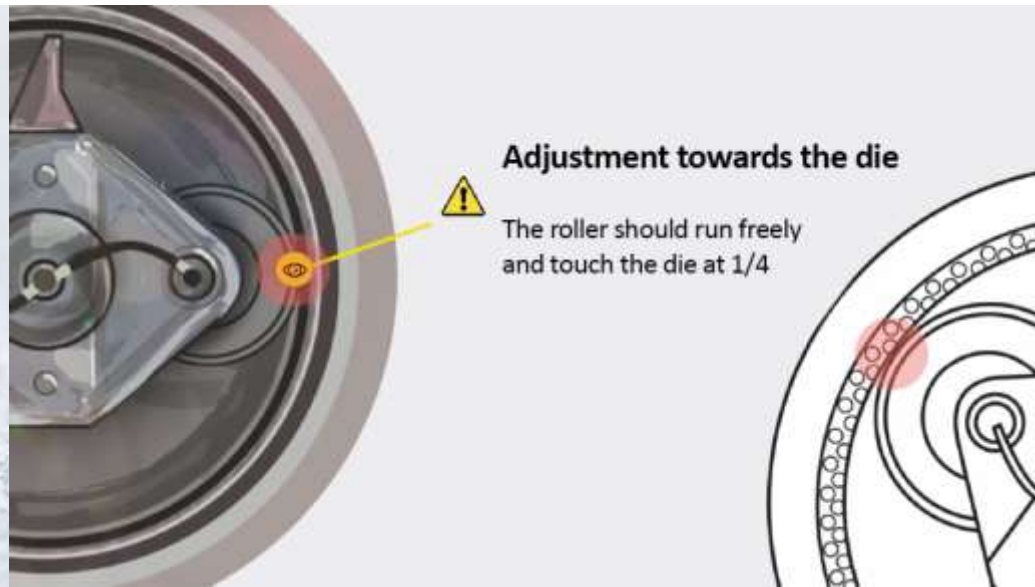
- Do not mix wood types randomly
- Look for a very homogeneous feed
- Clean magnets and sifters regularly
- Hammer mill maintenance is vital



1.3 Pellet Mill

A pellet mill isn't a black box you feed with saw dust and crop dollar bills

- Run in a new die with a mixture of saw dust, oil and quartz sand
- Daily adjust rollers against the die thoroughly
- Check moisture level in feeder & conditioner
- Check temperature of roller bearings daily



1.4 Other Aspects

Don't forget the big picture and train your staff well.

- Look for cost efficient changes:
 - In-house refurbishment
 - Cheap spare parts are only cheap on paper
 - Install a Preventative Maintenance System
- Optimize downtimes with training

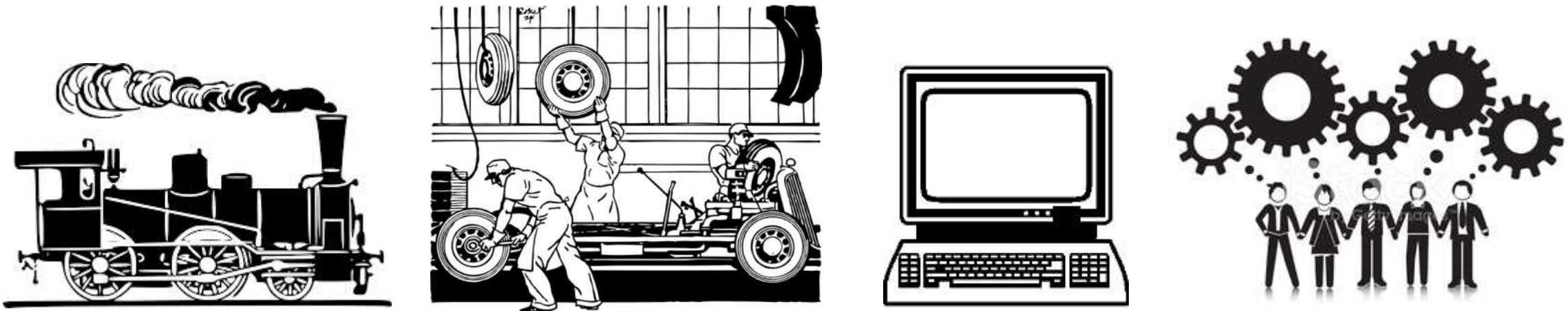


2. *Industry 4.0 in Pelletizing*

Industry 4.0 are intelligent and digitally interconnected systems that help creating a mostly self-organized production.

OR: Production meshes with IT and communication technology.

Industry 4.0 = Interconnection to improve flexibility and efficiency



2.1 What is it?

We call it Companion Media – It will be Siri / Alexa for pellet producers.

- Digitally demonstrate maintenance tasks
- Checklists for troubleshooting
- Training on the Job by using wearables
- Warn when component is about to break down
- Machines communicate through sensors

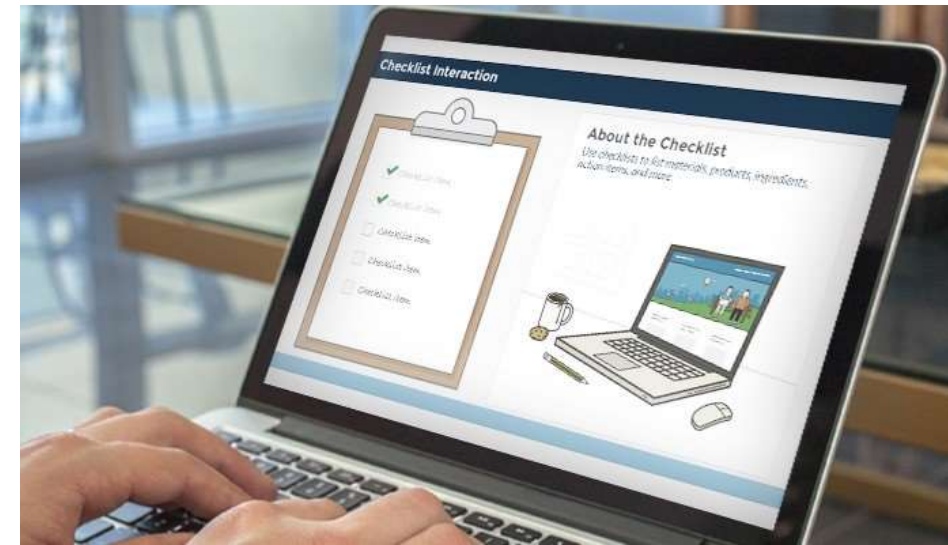
Stimulus-Response-Learning:

Point out a mistake when it happens → immediate learning effect

2.2 How to in a Pellet Plant

Our Companion Media approach improves competencies of staff and is an integral part of a Preventative Maintenance System.

- Intensify involvement through instant response
- Improve competencies with multi-media learning
- Upgrade service and maintenance tasks



2.2 How to in a Pellet Plant

2.2 How to in a Pellet Plant

Overall Equipment Effectiveness (OEE): Measure to Manage

Condition Monitoring: From run to failure to predictive maintenance

Availability

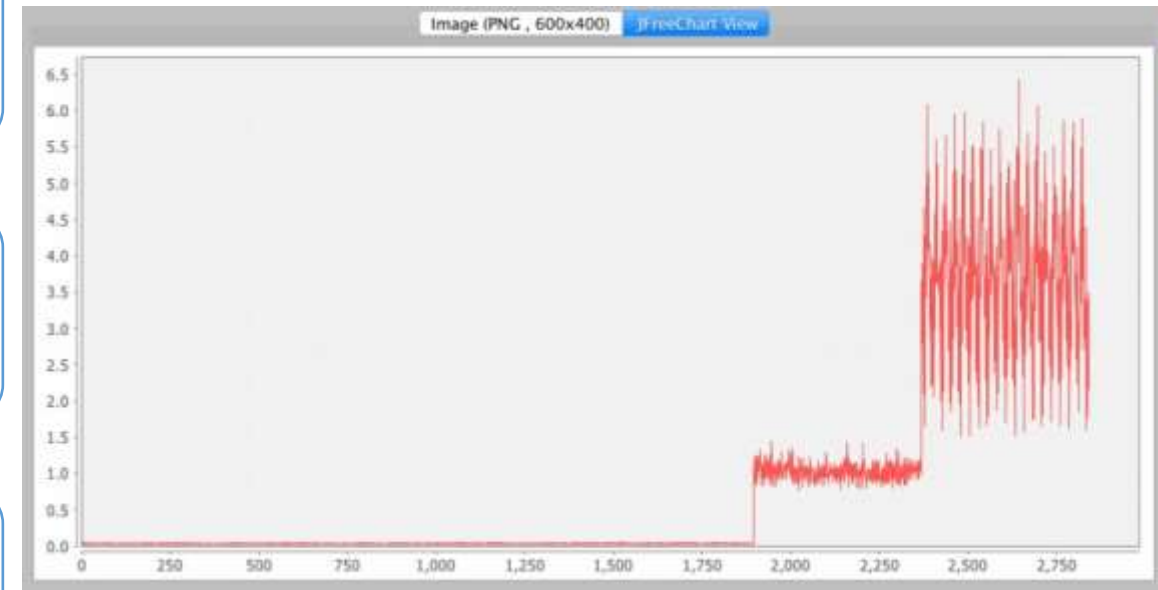
- Plan: Total operation time – planned downtimes
- Actual: Pot. production time – actual downtime

Performance

- Theoretical output – stoppages & dysfunctions
- = Actual output

Quality

- Actual output – scrap & rework
- = Good product



regular operation

event

dysfunction

5. Conclusions

- Innovations are rare in pellet industry – cherish the few
- Winning big time is about doing the small things right
- The image of Industry 4.0 is cloudy but with a chance of sunshine



Thank You!

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