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IIoT for batch centrifugals – initial results

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IIoT for batch centrifugals – initial results

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  - Introduction
  - Cloud technology for batch centrifugals
  - First user experiences with the monitoring of process data
  - Information layers and applications
  - Summary and conclusion

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Introduction

- **4th industrial revolution: “Industry 4.0”**
  - “Digital transformation”, “digitisation”, “artificial intelligence”
  - Many buzzwords are used, the objectification is mostly diffuse

- **User experience around the world**
  - Widespread use of mobile devices, particularly for personal use
  - In manufacturing, developments are slower and different

- **Cloud technology**
  - Use of enormous storage capacity and computing power in data centres
  - With worldwide internet access available at anytime
  - IIoT: “Industrial Internet of Things”

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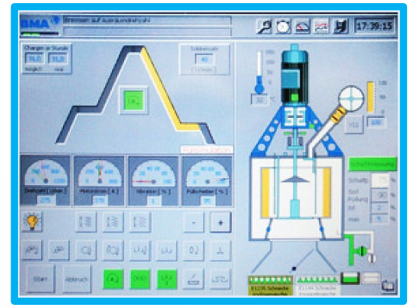
Cloud technology for the sugar industry:
smart4sugar® platform

- **Development project by BMA: smart4sugar® platform**
  - Making cloud technology available to sugar production
  - Platform for new features and digital services
  - Adding benefit to current automation level

- **First implementation: IIoT for batch centrifugals**
  - Upgrading local centrifugal control with data processing in the cloud

- **First application: smart.monitoring**
  - Collection of process data
  - Monitoring of the process data in a web application
  - Accessible anywhere, wireless and anytime



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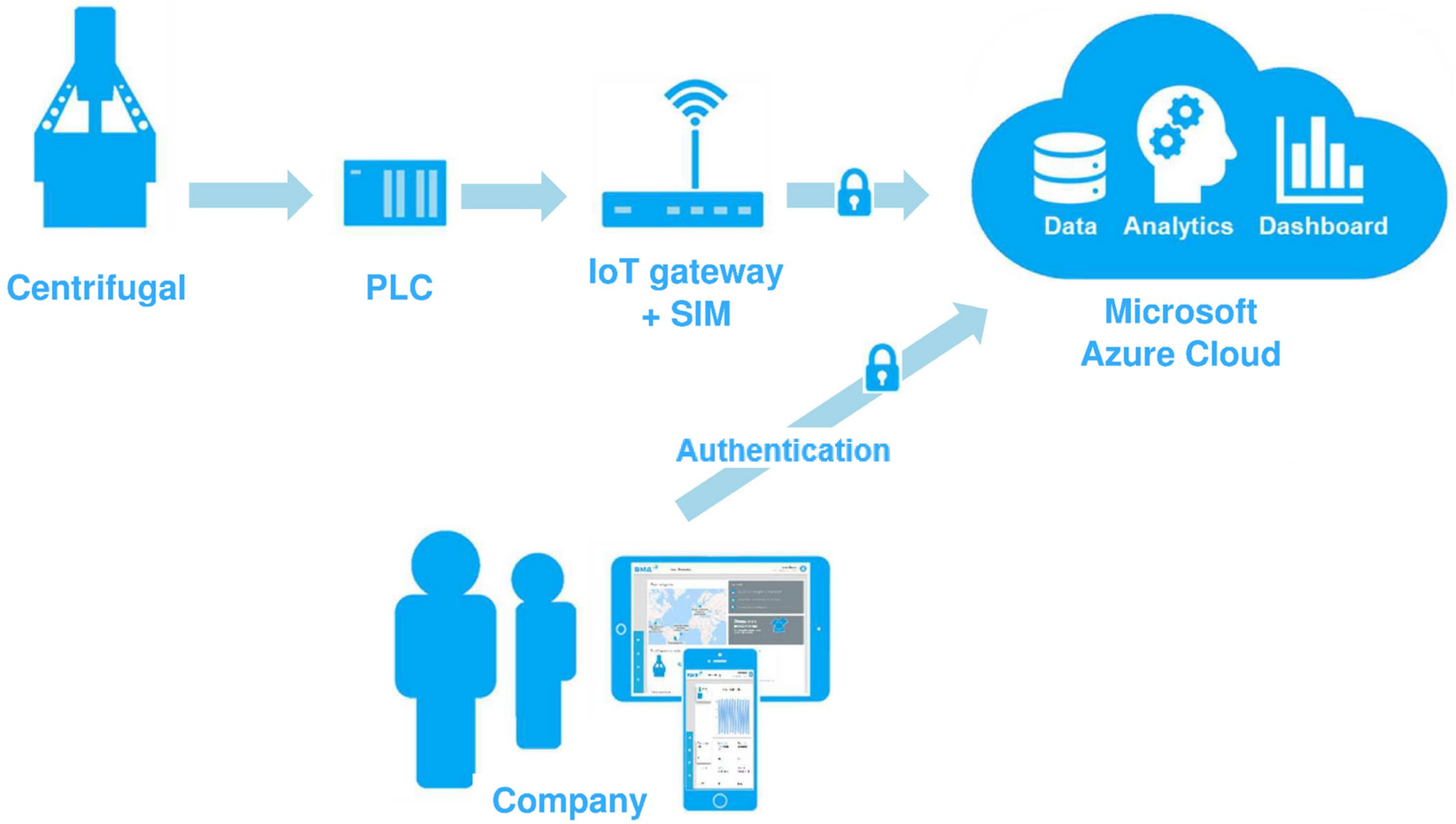
Cloud technology for the sugar industry: smart4sugar® platform



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Dashboard and drilldown: smart.monitoring

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First user experiences with the monitoring of process data

- **BMA centrifugals with cloud connectivity**
  - 2018: First installation started in Australia
  - Now introduced to several sugar producers around the globe
  - Development stage of the smart4sugar®platform: smart.monitoring
  - Display only of operating data,

- **BMA received feedback from senior managers and shift managers**
  - Display of information alone is not sufficient
  - A central control system should provide this information, too
  - Some employees already have remote access to a control system

- **Future developments and new applications**
  - “Predictive maintenance”, “machine learning” and “support by specialists” were thrown into the IIoT debate
  - We have to take into account additional and more diverse customer needs

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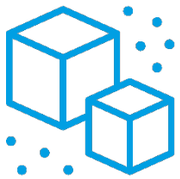
Information layers

Product layer information

- Massecuite quality
- Sugar quality



Parameter settings for optimised production

Machine learning

Process layer information

- Separation process
- Consumption figures

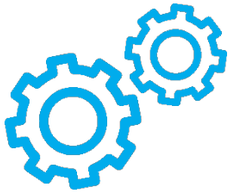
KPIs

History view

Benchmarking

Machine layer information

- Mechanics
- Electrics
- Service manual



Service information

Predictive maintenance

Online help

Chat in your language

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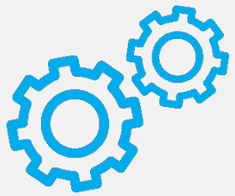
Machine layer information (1)

- **Mechanics**
- **Electrics**
- **Service manual**



Service information

Online help

Predictive maintenance

Chat in your language

- **Relevant information for: operators, service staff, service managers**

- **Machine manufacturers already offer this type of information in a range of applications today**
  - Mechanical and electronic sensors provide a far greater depth of information than regular checks by maintenance staff could offer
  - This is where “Industry 4.0” is booming

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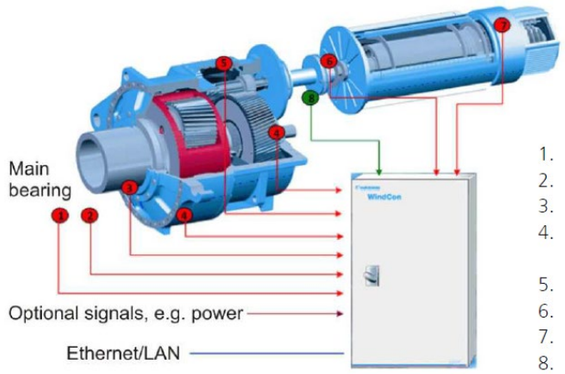
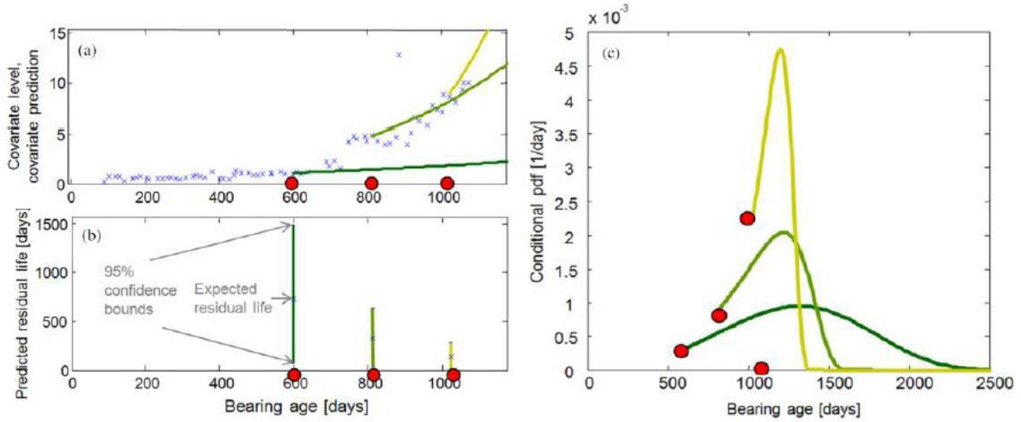
Machine layer information (2)

- **Examples from other industries: monitoring of drives in wind turbines**
  - Wind turbines are monitored using condition monitoring systems (CMS)
  - More than 2,500 wind turbines in Europe with CMS

- **Benefits of condition monitoring according to wind turbine operators**
  - Minimised risk of severe damage resulting in high repair costs
  - Performing cost-effective maintenance



1. Main bearing radial
2. Main bearing axial
3. Gearbox, main shaft
4. Gearbox intermediate speed shaft (2X)
5. Gearbox, high speed shaft
6. Generator, drive-side
7. Generator, non-drive side
8. Tachometer



Reference: Coronado D, Fischer K (2015) *Condition monitoring of wind turbines: state of the art, user experience and recommendations.* Project report VGB No. 383. Fraunhofer Institute of Wind Energy and Energy System Technology IWES Northwest, Bremerhaven.

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Process layer information

- **Separation process**
- **Consumption figures**

KPIs

History view

Benchmarking

- **Relevant information for: process engineers**

- **Process: separation of sugar crystals from the mother liquor**
  - Explicitly or implicitly available expert knowledge is implemented
  - Quick and efficient identification of ways to optimise the centrifugal sequences
  - Additional sensors chosen specifically for the task at hand can also considerably help optimisation

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Product layer information

- **Massecuite quality**
- **Sugar quality**

Parameter settings for optimised production

Machine learning

- **Relevant information for: production management**

- **Examples from other industries: control systems for rolling mills in steel production**
  - Neural networks have been implemented in local process automation systems for decades
  - By moving computing processes to the cloud, these control technologies become available for smaller systems

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Artificial intelligence

- **Artificial intelligence will in future assist users in their work in sugar factories**
  - By providing automated or semi-automated recommendations for action or warnings
  - Based on an automated analysis of the centrifugal data
  - Possibly by acting as a future alternative to finding qualified staff for sugar production

- **Artificial intelligence is still in the early stages of development**
  - Considering technical feasibility and economic benefits
  - Need to consider acceptance by the customer
  - A vision for the future would be the automatic adjustment of process parameters for sugar centrifugals to achieve an optimisation target

- **Example of application for wind turbine control systems**
  - Maximises the power output from an individual turbine, taking into account its mechanical condition

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Summary and conclusion

- **IIoT is now an attractive option**
  - Data centres provide “unlimited” storage capacities and computing power
  - User experience with devices for personal use paves the way for “Industry 4.0”
  - smart.monitoring on the smart4sugar®platform has started for batch centrifugals

- **Digital services can be assigned to different information layers**
  - Machine and electrical system | process | product
  - Targeting different user groups in sugar producing companies

- **Artificial intelligence in process manufacturing**
  - Still in its infancy
  - Expanded range of features offered is expected
  - Resulting in considerable benefits for processing methods

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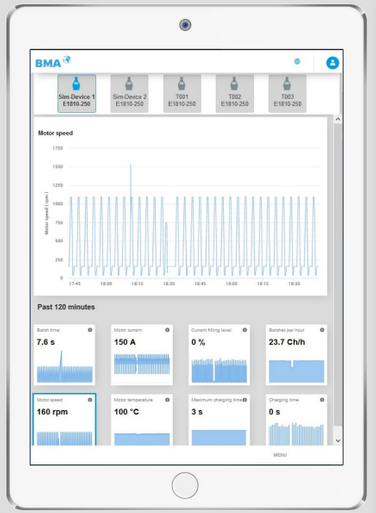
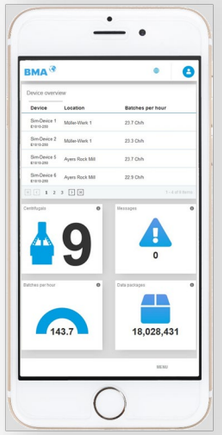
Acknowledgements

- **Staff of Wilmar Sugar Australia**
  - Installation of the first IIoT hardware on site
- **Software development team**
  - Programming with enthusiasm
- **Colleagues and users of the smart.monitoring dashboard**
  - Feedback





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Q&A #1

- **We are operating sugar mill of capacity of cane crushing of 15,000 MT/day. Can you give some idea of cost to start IIoT in a phase manner?**
- **All together what will be total expenses for using this for one number batch centrifugal machine?**
- **What are the licensing charges?**

  - **Hardware:** The costs to start with IIoT for batch centrifugals are divided in costs for the hardware – depending also on the already existing automation level - with installation at site and in the licence for the web application. For your individual offer / budget price please contact us on smart.monitoring@bma-worldwide.com

  - **Licence:** The Basic license starts at € 1,428 per year. The Pro version starts at € 4,188 per year. Detailed information can be found here. Please contact us for your individual offer on smart.monitoring@bma-worldwide.com

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Q&A #2

- **Hello, thank you for this presentation, Industry 4.0 is a must for the future. I wanted to ask you about AI (artificial intelligence) , how will this be technically done in batch centrifugals?**
  - AI is a combination of methods that have been selected from a catalogue of programs available for the cloud environment. The combination of such programs defines the base of AI. All calculations are done in the cloud.

- **Can this system be implemented on existing BMA machines?**
  - Yes, it can. The implementation depends on the control software version. A retrofit even lets you connect nearly any type of batch centrifugal from BMA. Please contact us at smart.monitoring@bma-worldwide.com for a personalised quote.

- **Can I use it with other equipment or only with centrifugals at the moment?**
  - Currently smart.monitoring can only be used with BMA centrifugals. The next products have already been identified and are under development.

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Q&A #3

- **Hello to all, thanks for this presentation. Are you going to prepare such webinar IIoT-info for our customers to assist?**
  - The webinar will also be made available on our homepage for everybody who could not assist live. For further information, BMA is happy to assist as usual.

- **Is it possible to get the performance data of machine or complete graph with all parameters?**
  - Currently, it is not possible to get the data out of the web app into e.g. your control system. Please have a look at out DEMO version of smart.monitoring here for all available data, graphs and parameters.

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Q&A #4

- **Whether it is possible to consolidate and compare data from different factories and compare the performance.**
  - Yes, if the centrifugals are belonging to the same company/group and the user has the authorisation to see them.
  - Moreover, anonymous benchmarking is on the list for future development.

- **Hello, first of all, thank you so much for the presentation. I would like to know, whether there is kind of a DEMO version available? I would like to see this by myself.**
  - Yes a demo version is available. Please register here to get the login data.

- **Is it possible to install smart4sugar in old supplied BMA machines?**
  - Yes. The way of implementation depends on the control software version. However, with a retrofit it is possible to connect nearly all types of batch centrifugals of BMA. Please contact us for your individual offer: smart.monitoring@bma-worldwide.com

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Q&A #5

- **With "Machine Learning" , Is there any consequences in parameters settings online ?**
  - There is no remote feedback directly to the centrifugal, only recommendations are planned.

- **If we don’t have BMA machine can this smart monitoring product can implemented to any make of machines?**
  - Currently smart.monitoring can only be used with BMA centrifugals. The next products are already identified and under development.

- **How is smart4sugar helping to improve the sugar quality?**
  - smart.monitoring allows for remote live monitoring of the current process characteristics and results and this in turn can be the basis for improvements.
  - smart.monitoring in the current version gives you the possibility to follow the process and to counteract if something happens. For example, if a colour measurement system is installed, this signal will be included in the smart.monitoring app.
  - Also BMA can support you easily, once the machines are connected.

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Q&A #6

- **Throw some more light on the gateway used for capturing data**
  - This is a industry standard device. It is a router with a encrypted internet connection to the Microsoft Azure cloud, simple as it is.

- **Do you believe that customer could be afraid to share his process data such sugar quality massecuite?**
  - No process data is shared with third party companies. Access to the process data depends on authorisation, which is managed by the customer himself.

  - The process data are owned by the customer, details or any doubts can be clarified in a direct talk with BMA, please don’t hesitate to contact us on smart.monitoring@bma-worldwide.com

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Thank you for your attention!

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