

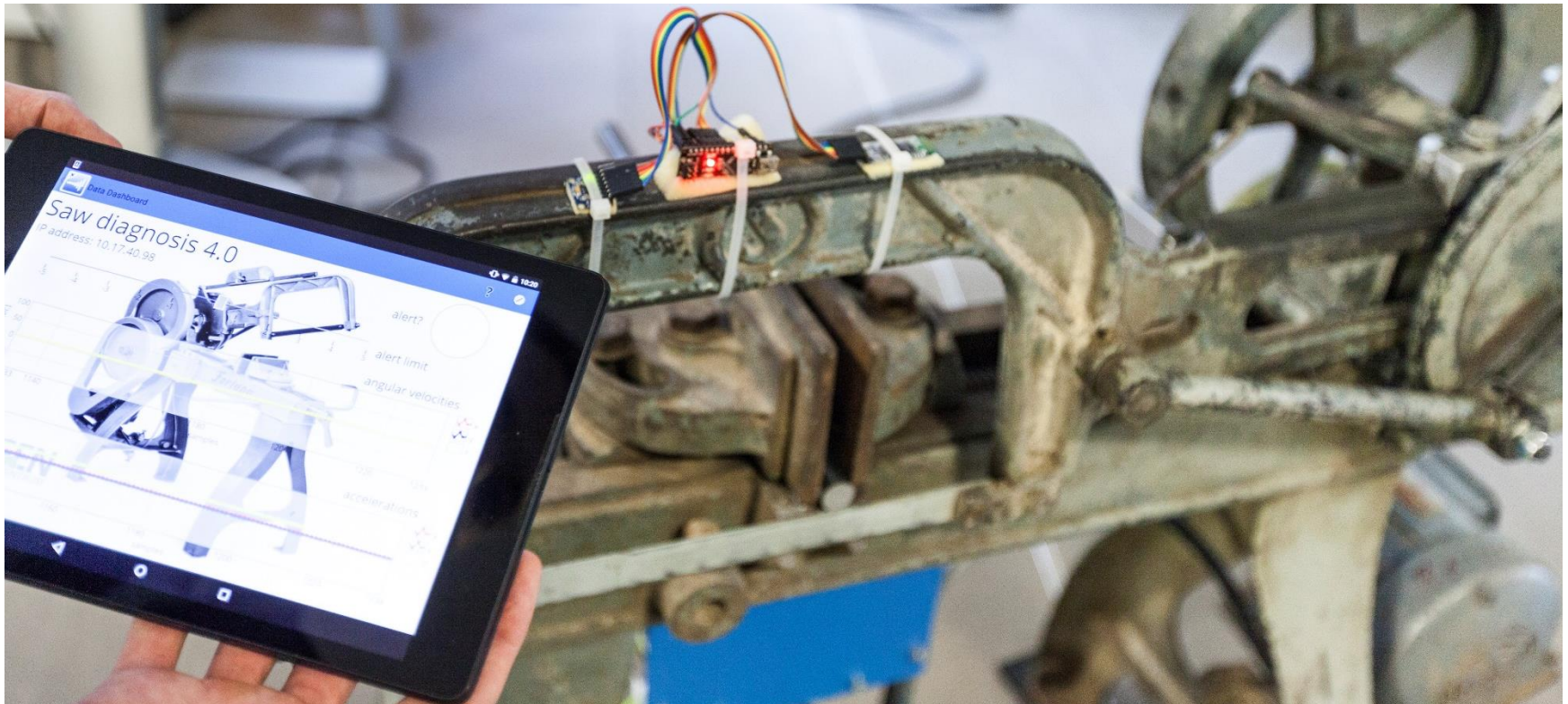
# Applied Research for Saw Users

## REQUIREMENTS & INNOVATIONS

KASTO Future Days 2018

Florian Schumpp, Tim Mayer

Fraunhofer Institute for Manufacturing Engineering and Automation IPA



# Agenda

- Short introduction to the Fraunhofer IPA and the Kompetenzzentrum Sägen Stuttgart (Center of excellence for sawing, Stuttgart)
- Current challenges for users
- Examples of solutions
  - New lubrication/cooling concept for circular saw tools
  - Requirements for digitalization in the field of sawing and of premanufacturing steps
  - Industry 4.0/digital transformation (fourth industrial revolution) applications for saw users





# Fraunhofer IPA

## Technology consultant and innovation driver

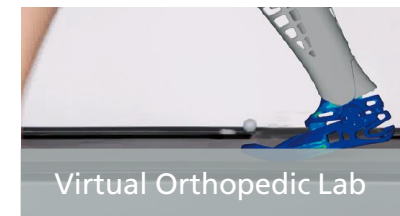
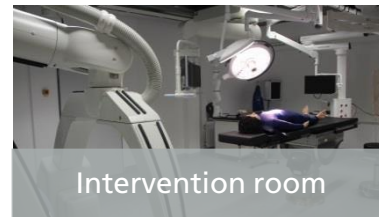
- Third largest institute of all Fraunhofer institutes and located in Stuttgart
- More than 1,000 employees | €63.0 million total operating budget | €24.1 million total industrial revenues
- Expertise in manufacturing engineering and automation since 1959



Hinweis: Zahlen beziehen sich auf das Jahr 2017

# Fraunhofer IPA

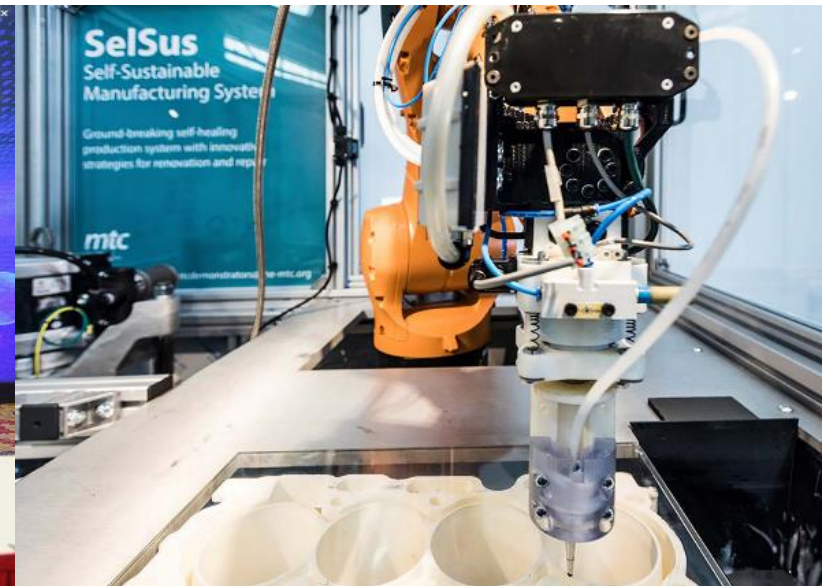
## In tune with the times





# Fraunhofer IPA with an international network

- Field offices and project centers in Germany, Austria, Hungary and Japan
- Further partnerships under development in the USA and China
- A fifth of all projects are outside Germany



Source, left-hand photo: School of Mechanical Engineering, Shanghai JiaoTong University

# Cooperating at the highest level

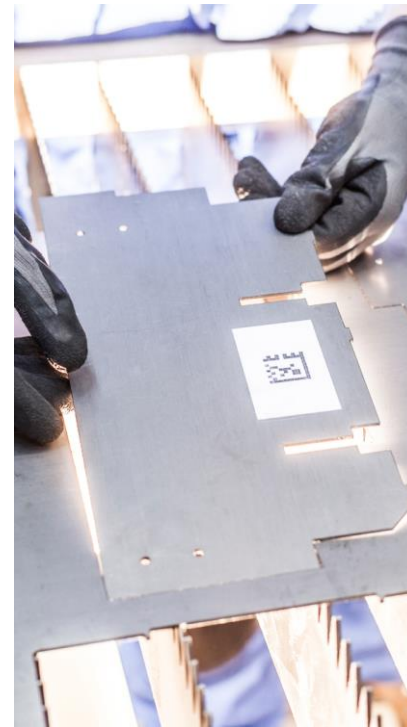
## “Industry on Campus” with centers and labs



Automotive:  
“ARENA2036”



Ergonomics:  
“Future Work Lab”



Machines:  
“Metal processing  
of the future”



Laboratory:  
“nICLAS”

Note: selected current lighthouse projects

# The Kompetenzzentrum Sägen Stuttgart

## Research in the field of sawing technologies

Cooperation:



Fraunhofer Institute for  
Manufacturing  
Engineering and  
Automation IPA



Institute for  
Machine Tools (IfW),  
University of Stuttgart



Universität Stuttgart  
Institut für Industrielle Fertigung  
und Fabrikbetrieb IFF

Institute of Industrial  
Manufacturing and  
Management (IFF),  
University of Stuttgart

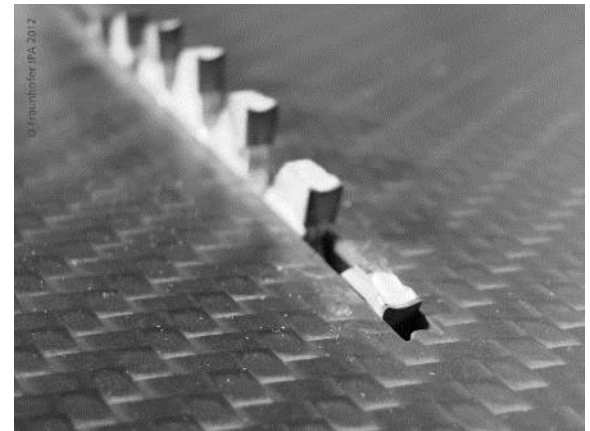
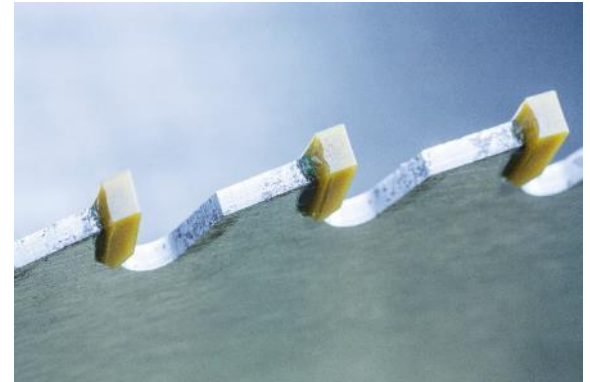
**Bundle research activities in the field of sawing machines, sawing tools and processes at Stuttgart**



# The Kompetenzzentrum Sägen Stuttgart

## Unique in Germany

- Currently 11 engineers working on 14 research and development projects in the field of sawing technology. – **Research focus on sawing technologies**
- Material-independent expertise by the working groups for metal, wood and composite materials  
– **irrespective of the application**
- Unique process understanding through holistic approach and the involvement of industry participants – **research of all sawing processes**





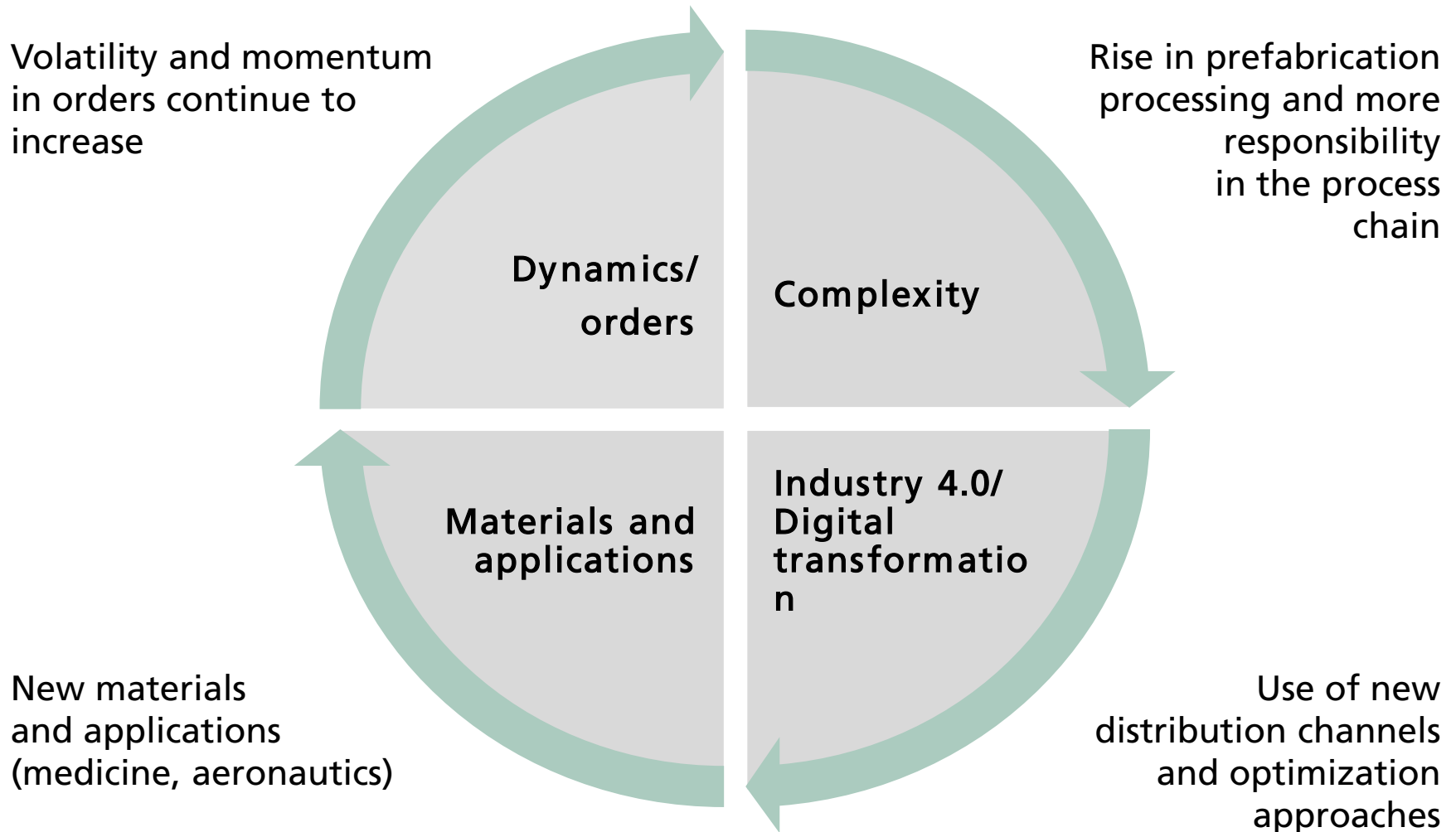
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# Challenges for users

## Market conditions and requirements



# (New) topics in the user industry

## Market conditions and requirements

### ■ Increasing complexity in the production

Today, significantly more value-added steps than in the past by shifting from processor to trader. Increase in type and number of prefabrication processes.

### ■ Digitalization enters the industry

Demand also within the user industry

### ■ Reaction times

Flexibility of the machinery/plants and efficient utilization and logistics are an increasing competitive factor

**Increase in productivity and process reliability,  
efficient tools and processes, worker's support,  
digitalization and Industry 4.0 solutions**



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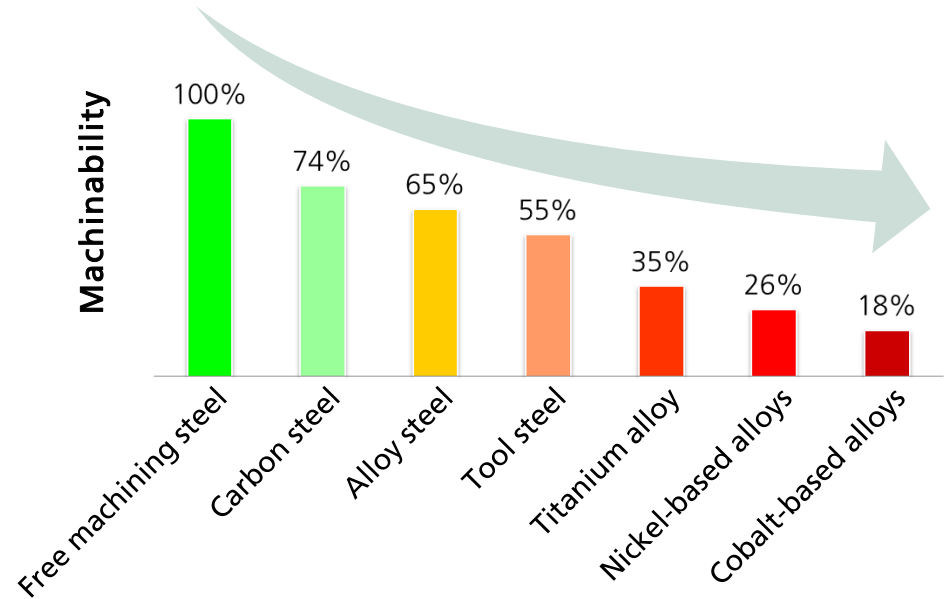


# Innovative lubrication/cooling concept for circular saws

## Potential of lubrication/cooling in the sawing process

High-strength and heat-resistant materials place special requirements on the cutting process.

- Low thermal conductivity
- High temperatures at the cutting edge
- Long process times
- High tool wear

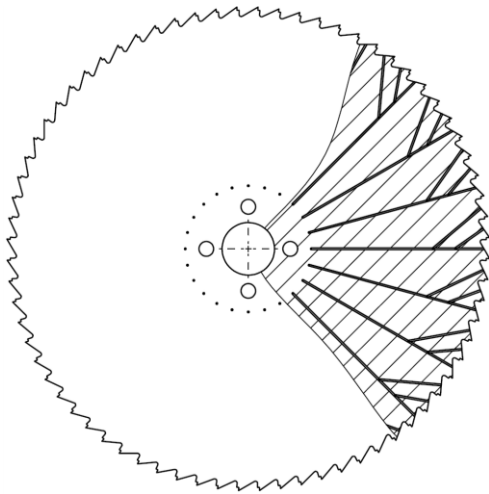


**Need for innovative solutions to achieve economical machining of complex material systems – such as coolSAW**

[Quelle: nach IWU]

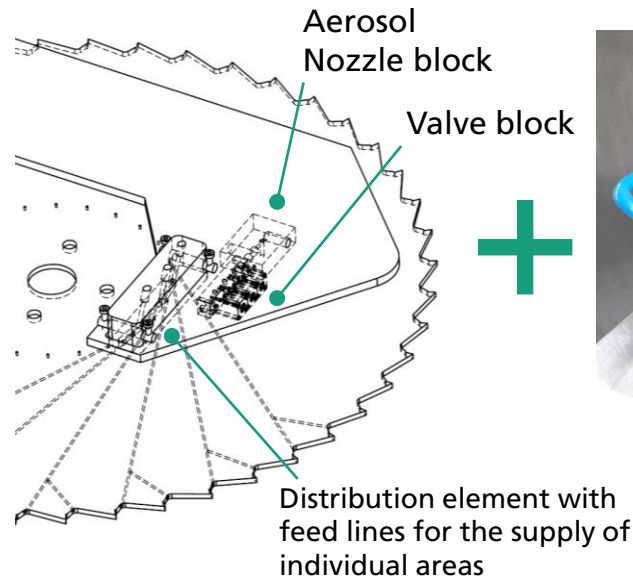
# Innovative lubrication/cooling concept for circular saws

## Internally cooled circular saw – features and benefits



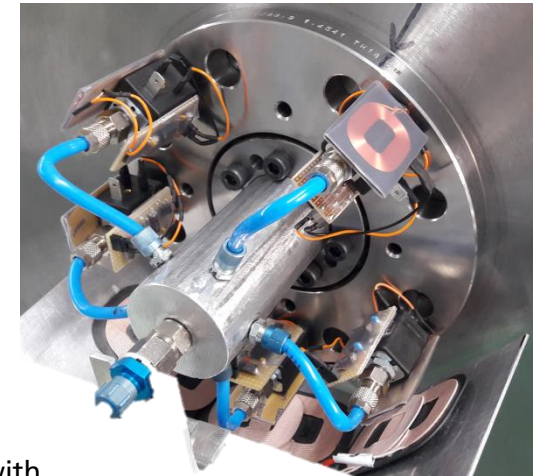
### Innovation 1:

Circular saw tools with internal channels for the supply of cooling lubricant



### Innovation 2:

„Distribution element“, which is able to release individual holes



### Innovation 3:

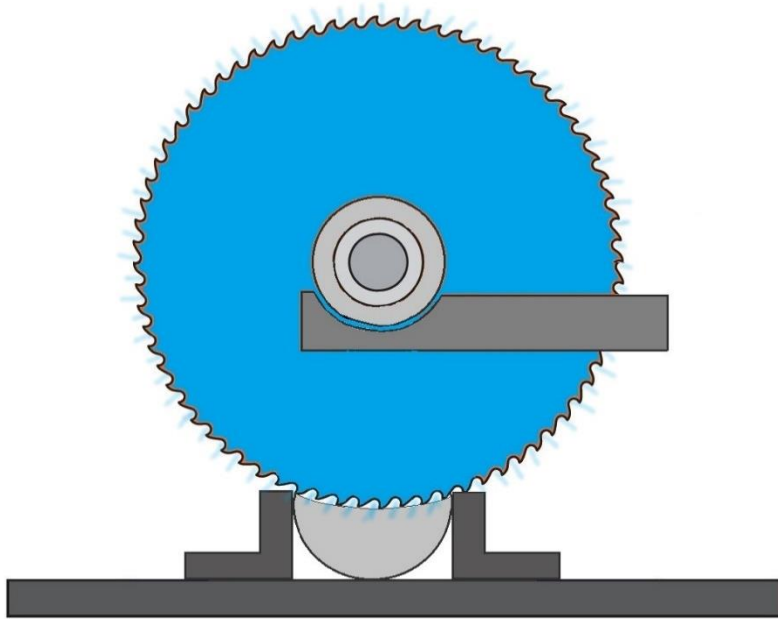
Controller with smart feature for a need-based supply of cooling lubricant



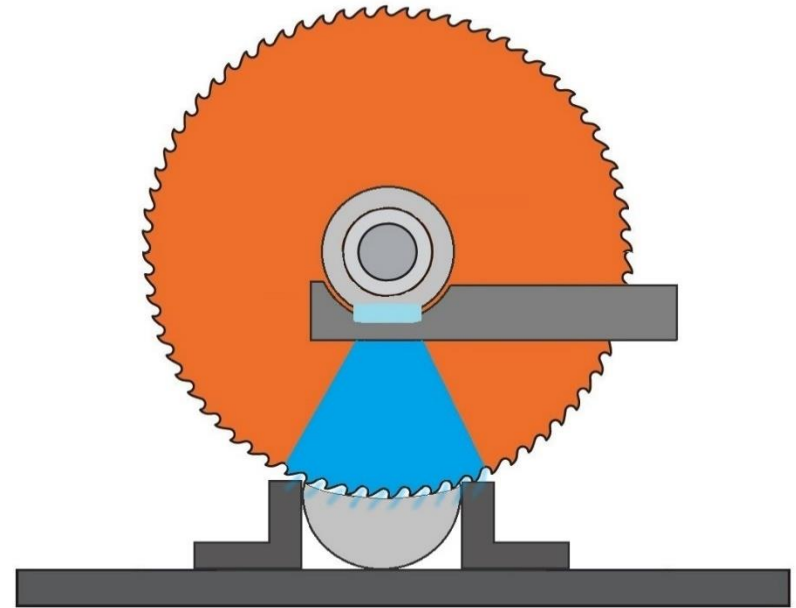
# Innovative lubrication/cooling concept for circular saws

## Internally cooled circular saw – features and benefits

Complete lubricant discharge



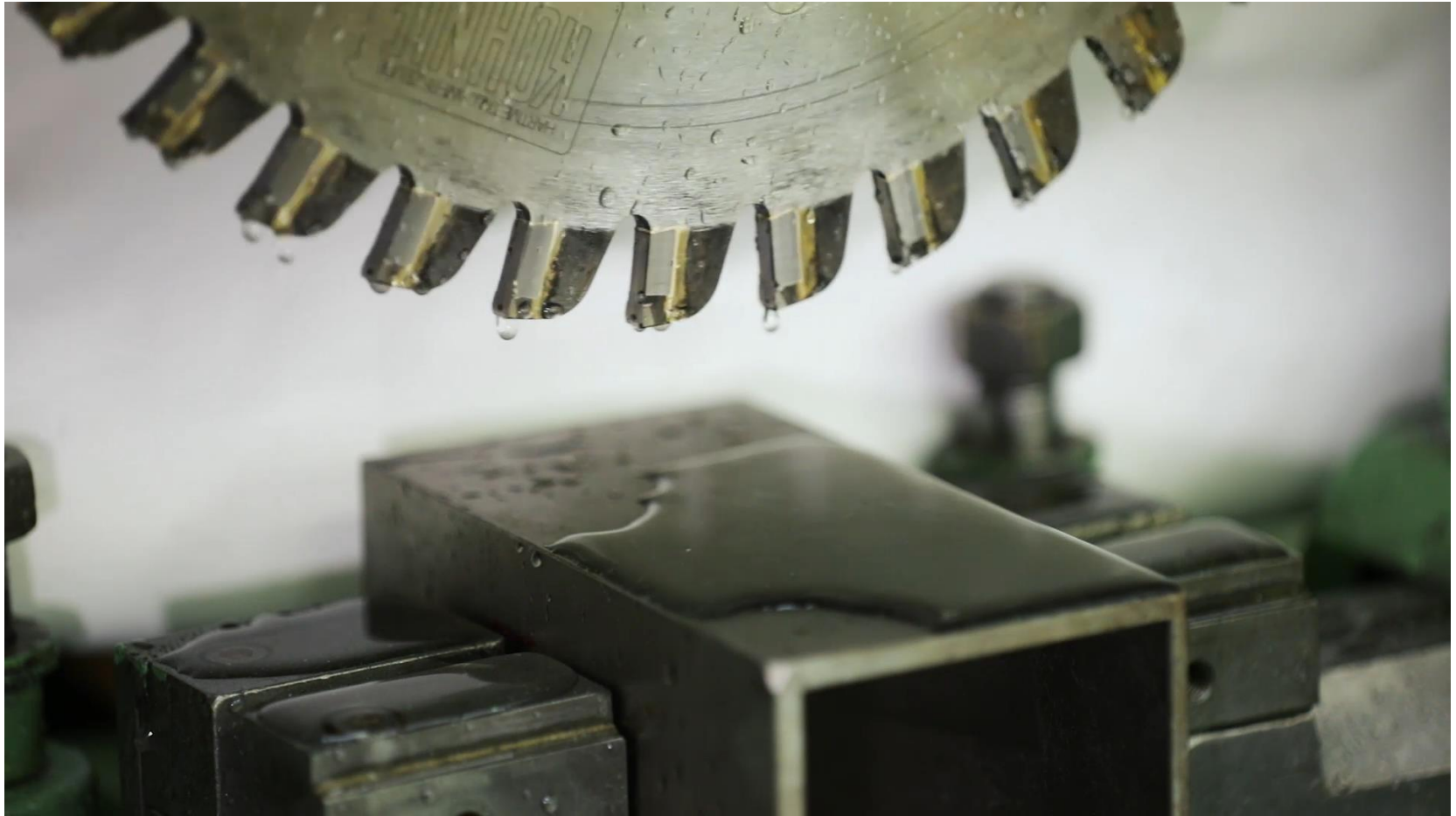
Local lubricant discharge



→ Up to 80 % savings in the amount of cooling lubricant

# Innovative cooling concept for circular saws

## Demo



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# Industry survey: Industry 4.0/digital transformation in metals trade

## Current situation and requirements

- Aim of the survey:  
Reveal the current situation and future requirements of steel and metals trading companies regarding digitalization and Industry 4.0/digital transformation
- Core contents:

Industry 4.0 from an industrial perspective: expectations, acceptance, challenges, benefits, data collection and analysis	State of implementation and future plans for the implementation within the companies
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- Core aspects of the survey:
  - Survey results of roughly 65 companies with a metals trading background
  - Complemented by expert interviews

# Industry survey: Industry 4.0/digital transformation in metals trade

## Current situation and requirements

- The results will be published in a study.

# Agenda

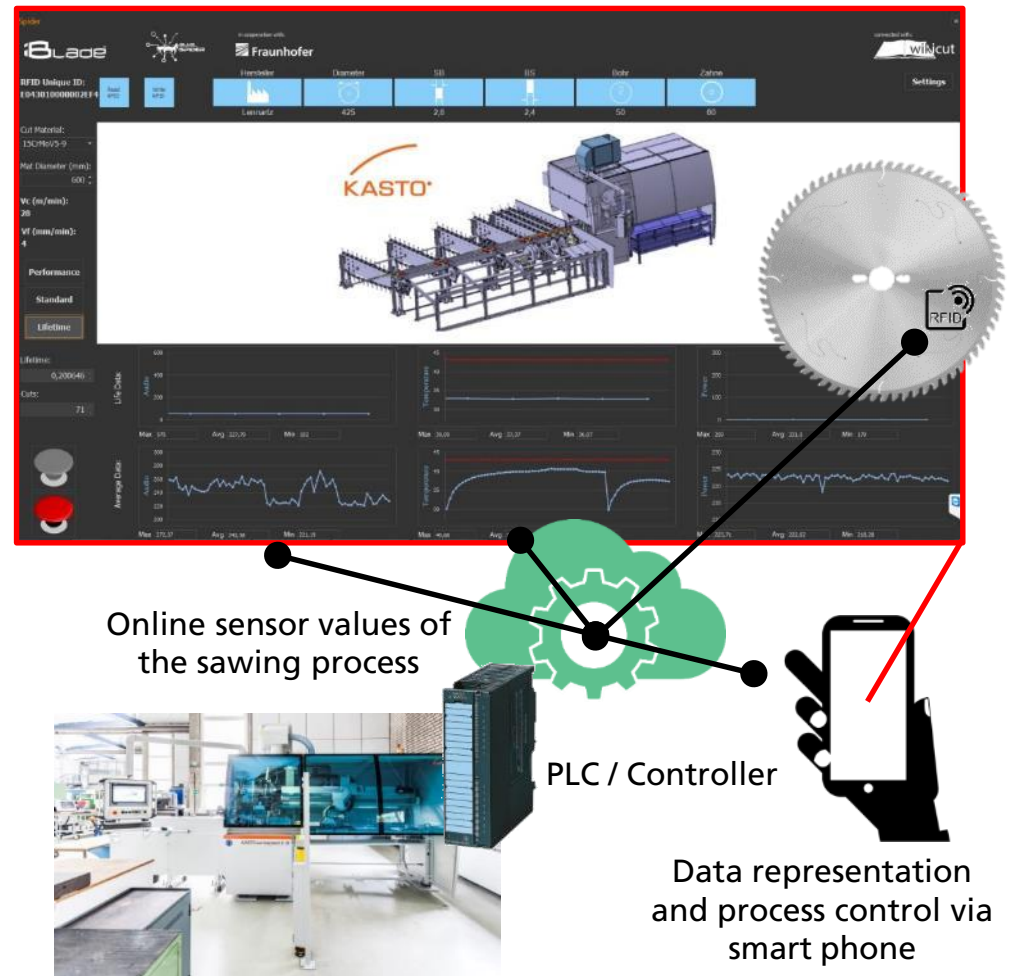
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# 14.0 application example 1: process monitoring

## Data collection for sawing process and tool life cycle

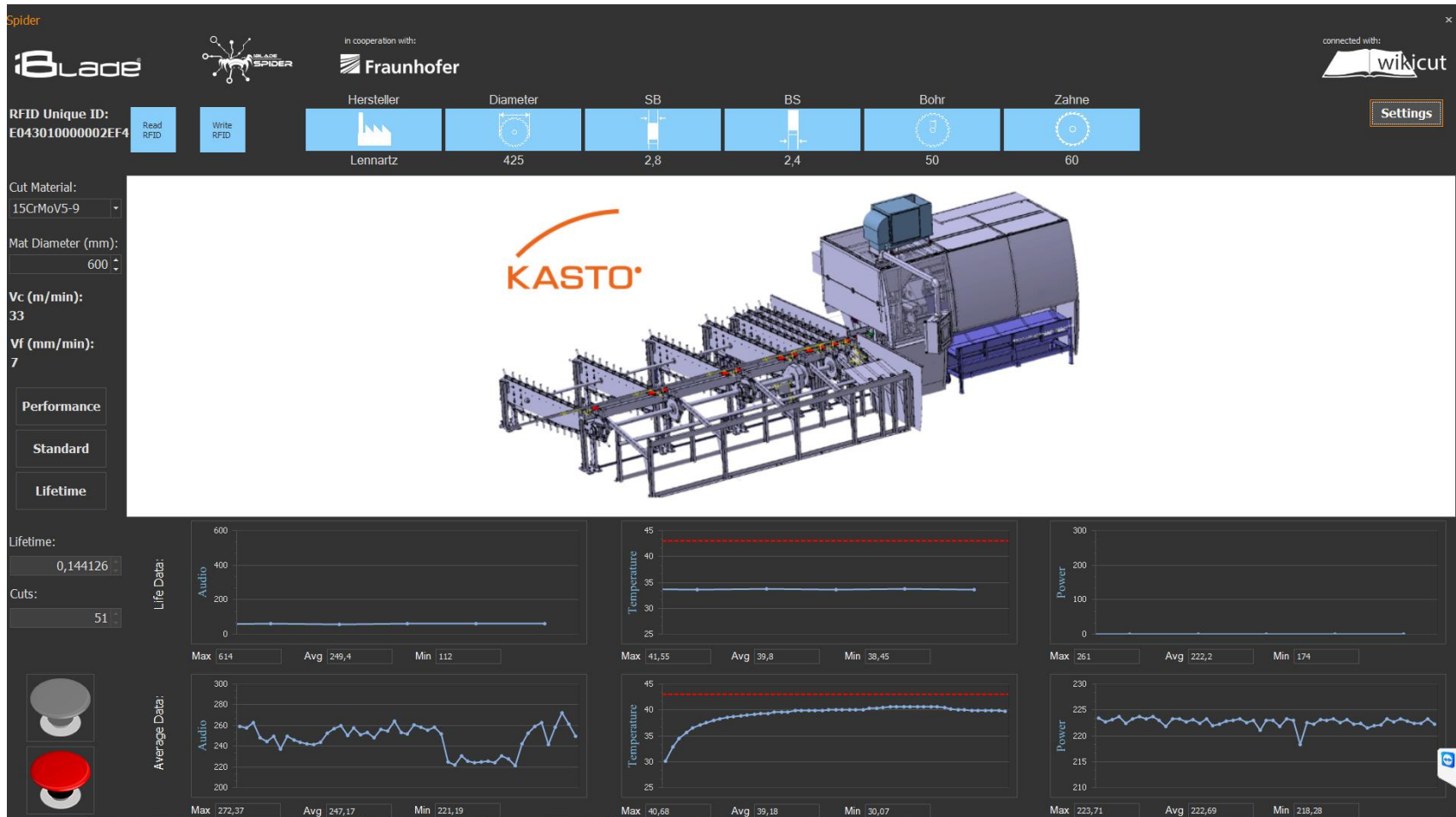
- Real time process monitoring of the circular sawing process
- Intelligent lifetime monitoring
- Production data is connected, processed and provided
- Possibility to access the machine controller in real time





# I4.0 application example 1: process monitoring

## Data collection for sawing process and tool life cycle

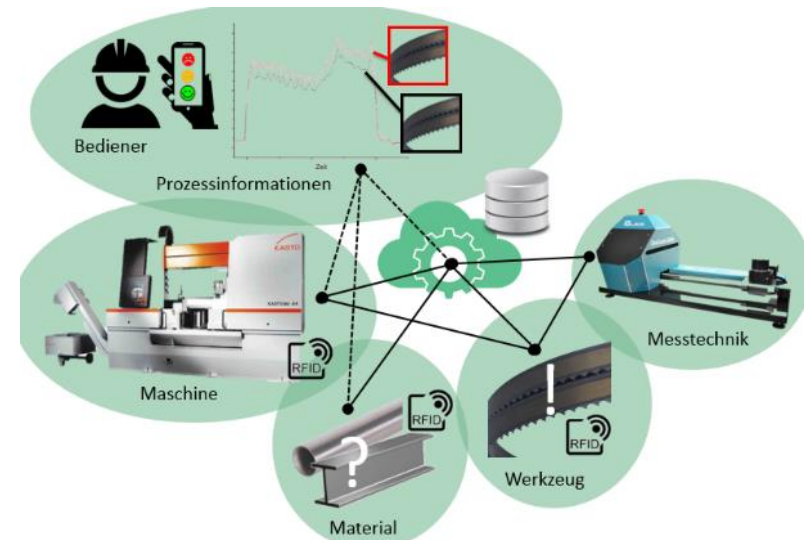


# Example of a I4.0 setup for users

## Intelligent operating and assistance concepts

Support of the operators digitally through consistently connecting humans and means of production (tool/process/machine/measurement technology)

- Overview of the tool history (Resharpening, lifetime,...)
- Tool and machine parameters according to the database specifications
- Avoid operating errors and machine downtimes
- Operator is being supported by a context based menu navigation, e.g. an inexperienced and trained machine operator



# I4.0 application: process monitoring

## "I4.0 upgrade" of existing machines to have a basis for the digitalization

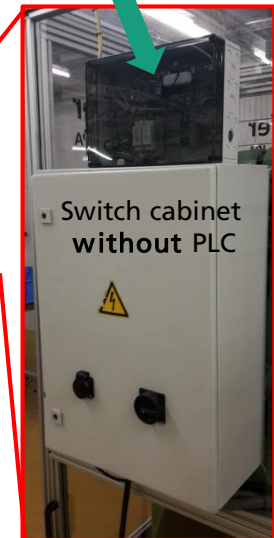
- Solid stock of machines without networking features and partially without any control system
- Retrofit solutions based on an open source hardware kit for „everyone“
- Cost-effective and fast connection possibilities to networks and thereby access to monitoring and assistance.

Electronic module:  
Single-board computer

Technology carrier IPA



Maschine,  
year of construction  
1970



Switch cabinet  
without PLC

# Summary

- Market and business conditions of saw users are increasingly dynamic: new challenges for the industry.
- New tools with internal cooling offer a precise process lubrication and significant potential savings in the amount of cooling lubricant: New approach for high-performance materials
- Digitalization is entering the industry of users of saw technology: opportunities for optimized processes, support of the machine operator and new business models

**In addition to more productive tools and processes,  
digital solutions are required in the future!**



# Fraunhofer IPA

## Your contact person



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