Intelligent tools for future machining
Transforming Manufacturing With Industrial IoT
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Who am I?

- MSc in mechanical engineering
- Worked at Sandvik Coromant for 20 years with both R&D and production, in both engineering and management positions
- Been expat 10 of these years 1,5 years in US, 5,5 in China and 3 years in Norway
- Received Sandvik Innovation Award 2004 for the development of CM590 that today is used in production for iPhones since iPhone 5
What is metal cutting?

Shaping components with cutting to tight tolerances for all kinds of applications
Topics

• Our company’s aim in Industrial IoT
• What we do physically
• IoT solutions
• Customer value
“Big data is not about the data. While data is plentiful and easy to collect, the real value is in the analytics”

– Gary King, Harvard University
Advanced machining analytics

- Process intelligence from micro to macro level – machining, factory, enterprise.
- Connected tools and machines for live stream monitoring and process optimization.

Design and planning connectivity

- Tool and cutting data recommendations integrated into your CAD/CAM environment.
- Built on ISO 13399, tool library open for all cutting tool suppliers.

In-machining connectivity

- Sensor-based tool intelligence, all the way from the cutting edge.
- Machine monitoring IoT system for increased security in the machining process.
- Easy, remote tool configuration.
Resource planning and optimized factory diagnostics

Big data analytics

Shop floor monitoring and flow optimization

Process monitoring and diagnostics. Autonomous tools and machine control

Enterprise

Factory

Machine
Design and planning connectivity
- CoroPlus™ ToolGuide
- CoroPlus™ ToolLibrary

In-machining connectivity
- Silent Tools +
- CoroBore +
- Promos 3 +

Advanced machining analytics
- CoroPlus™ Enterprise
Real-time tool and process monitoring for increased machining security

Promos 3+

A solution from:

CoroPlus™ Enterprise

Multiple level manufacturing analyses
Promos 3+
Real-time tool and process monitoring for increased machining security
CoroBore® +

Fine boring tool with embedded system for wireless, automatic cutting diameter adjustments.
Damped turning adaptors with embedded connectivity for process optimization

Silent Tools™ +
The challenge in these difficult to produce components is actually to even know what you are doing......
To know more of what’s actually going on is of great value for someone producing a jet engine shaft.

A cut through of a component

A typical manufacturing machine for a jet engine producer
Solution

Sensored tools!

Opportunity to know a lot more about the process
Value creation for our customers

By sensoring our tools we can:

• Have shorter set up times for the process
• Indicate the surface quality being produced
• Indicate vibrations
• Monitor temperature
• Record cuts
• Tell the operator if he is cutting or not
• Indicate when the tool is worn out
If you do it wrong you end up like this

Results from severe vibrations with no control:

- Irregularities in the surface
- Cut material welded into the surface

Who wants to fly this plane?
Do all these new functions deliver value to the customer? We believe they do

Shorter set up times

- Increased running time and value creation for customers
- The bigger the tool, the more value
- Gyro in the tool and connection to the device
Tool Setup

• Quick setting of center-height.
• Target any machine angle.
• Gauge turns green within +/- 1°
Do all these new functions deliver value to the customer? We believe they do

Surfaces and vibrations

- All components matter

- Indicators help operators take action
Do all these new functions deliver value to the customer?
We believe they do

Record cuts

- In this environment there are at least 20 parameters that affect the end result.

- Recording what you are doing will give the operator an advantage.

- Quality documentations and process improvements can be made easier.
Records of cuts – Chip jamming

Normal grovkjoring: 250vc 0,25f 2 ap. 04PF
Records of cuts – Chip jamming

FINISHING

Synlig strek i finish på ca sample 180. 250vc 0,12f 0,5ap. 04PM

Scratch on the surface
Records of cuts – Chip jamming

Skjaerbrudd på grovkjoring! 250vc 0,25f 2ap. 02PF
Value creation

Lets elaborate on future scenario in monitoring

- By monitoring processes with sensors and algorithms based on our knowledge we put the customer in a much better position.
- We give the advice of what to do for the operator.

The real value here is

• Less scrap production
• Documented process
• Higher quality
• Process knowledge
New ways of working with IoT in the process

- Value creation instead of supervising
- Fewer and faster quality checks
- Records of previous and current processes
- No uncertainty of when tools need changing
Lessons learned so far

• The difference between value chain and eco-system is collaboration

• Build to learn not to last, efficiency comes later

• Security can never be overestimated, to gain you need to share
At last

MONITOR

CONTROL

OPTIMIZE

AUTONOMY