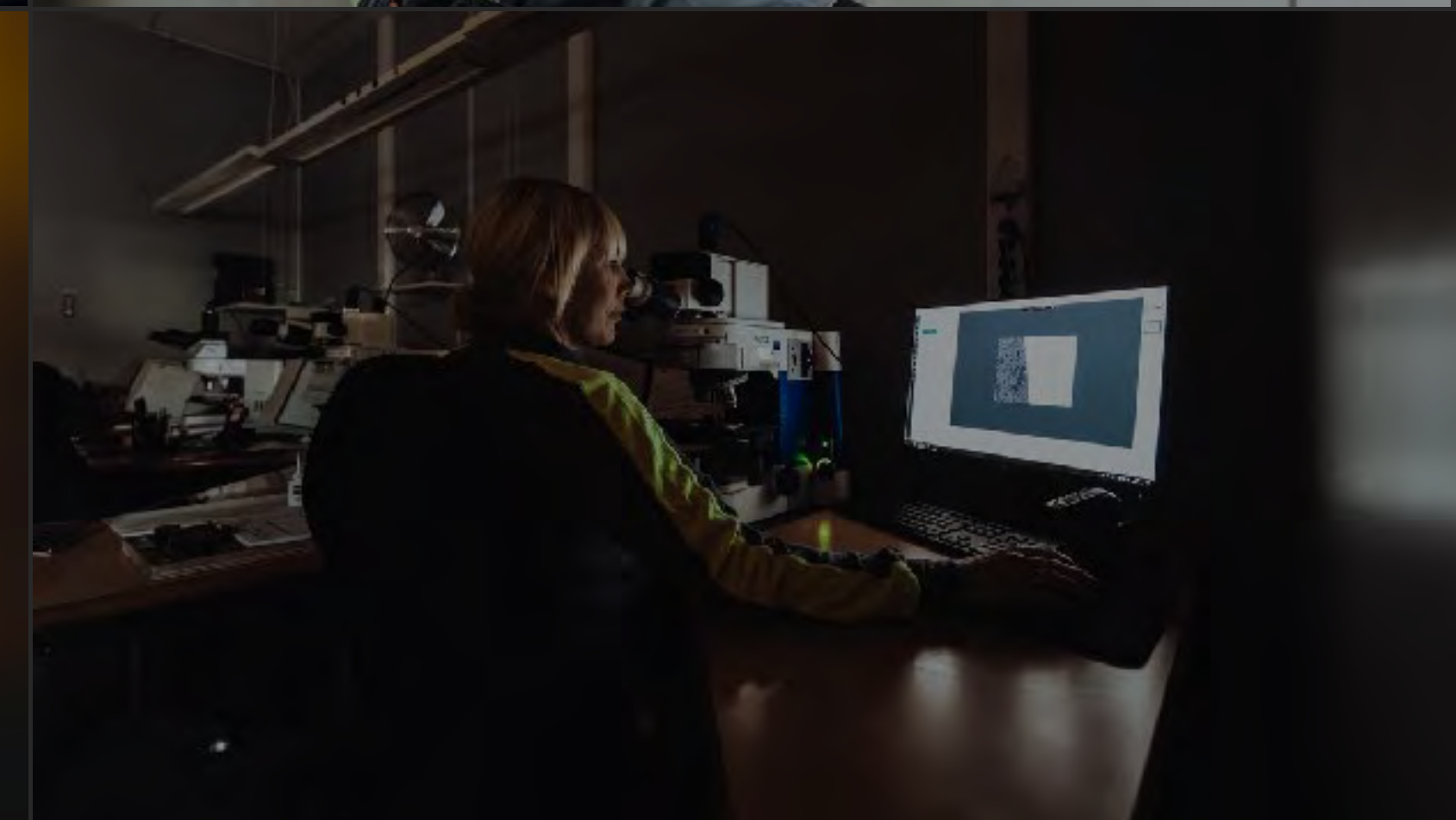


Keynote Talk by Claes Nord at the 15th
MODPROD Workshop 3-4th February 2021
at Linköping University

For more information and the workshop
proceedings see
www.modprod.org



Factory of the future

Sandvik Coromant Gimo - a WEF Lighthouse



A group of seven Sandvik employees standing in front of a large digital display showing the Sandvik logo. The employees are dressed in a mix of professional and industrial attire, including a white lab coat, grey polo shirts with high-visibility yellow accents, and a light blue button-down shirt. Two employees are wearing orange hard hats. The background is a dark, perforated metal wall with the Sandvik logo in large, blue, 3D-style letters.

SANDVIK

Our company

Driven by expertise and imagination



40,000
Employees

Sales in over

160

Countries
Around The Globe

1000

Billion Sek In Revenues

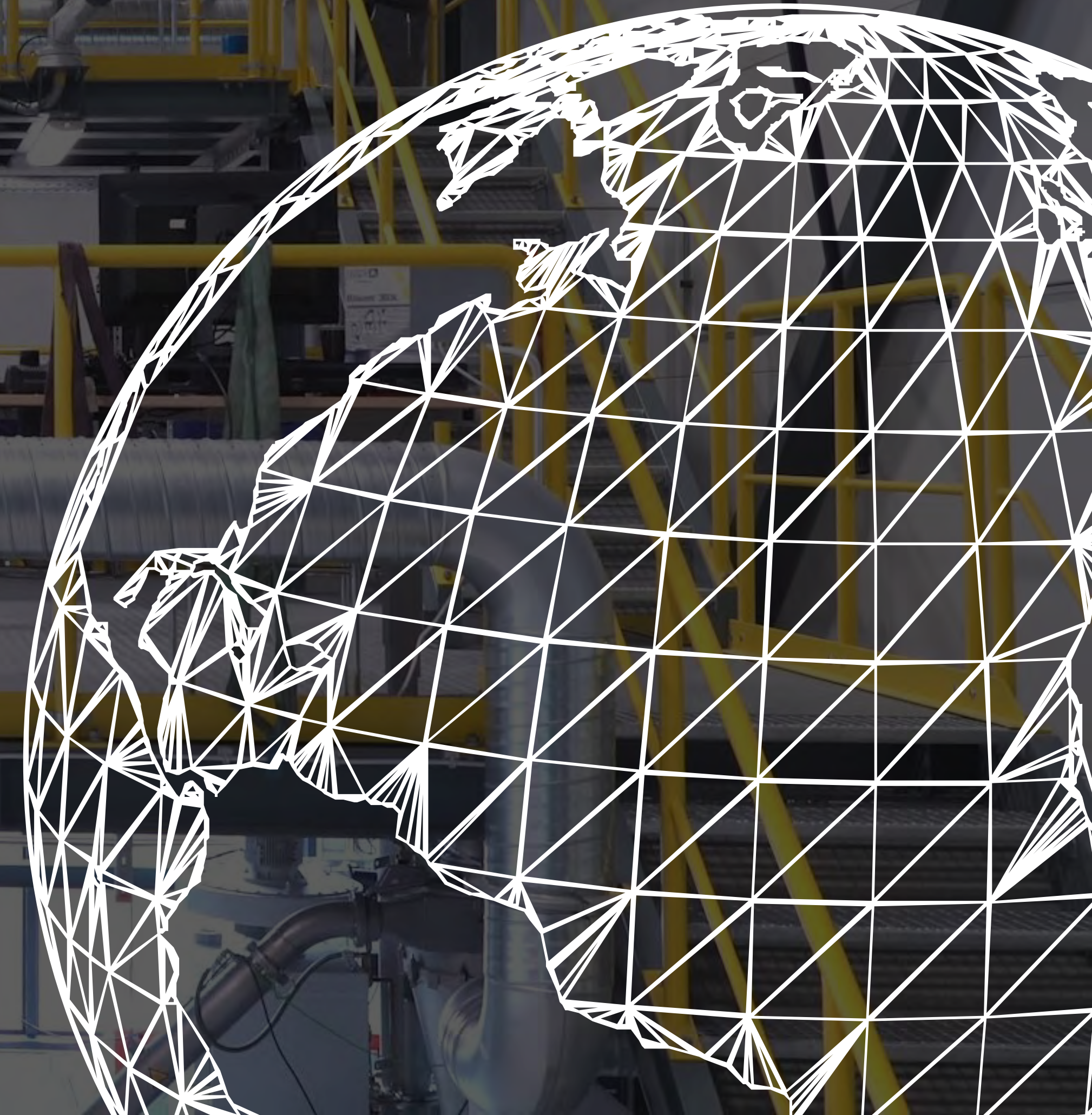
3.9 Billion Sek
Annual R&D
Investment

50

R&D Centers
Globally

6,100

Active Patents



SANDVIK

SANDVIK MINING
& ROCK SOLUTIONS



SANDVIK ROCK
PROCESSING SOLUTIONS



SANDVIK MANUFACTURING &
MACHINING SOLUTIONS



SANDVIK MACHINING
SOLUTIONS



SANDVIK MANUFACTURING
SOLUTIONS

SANDVIK MATERIALS
TECHNOLOGY



SANDVIK COROMANT



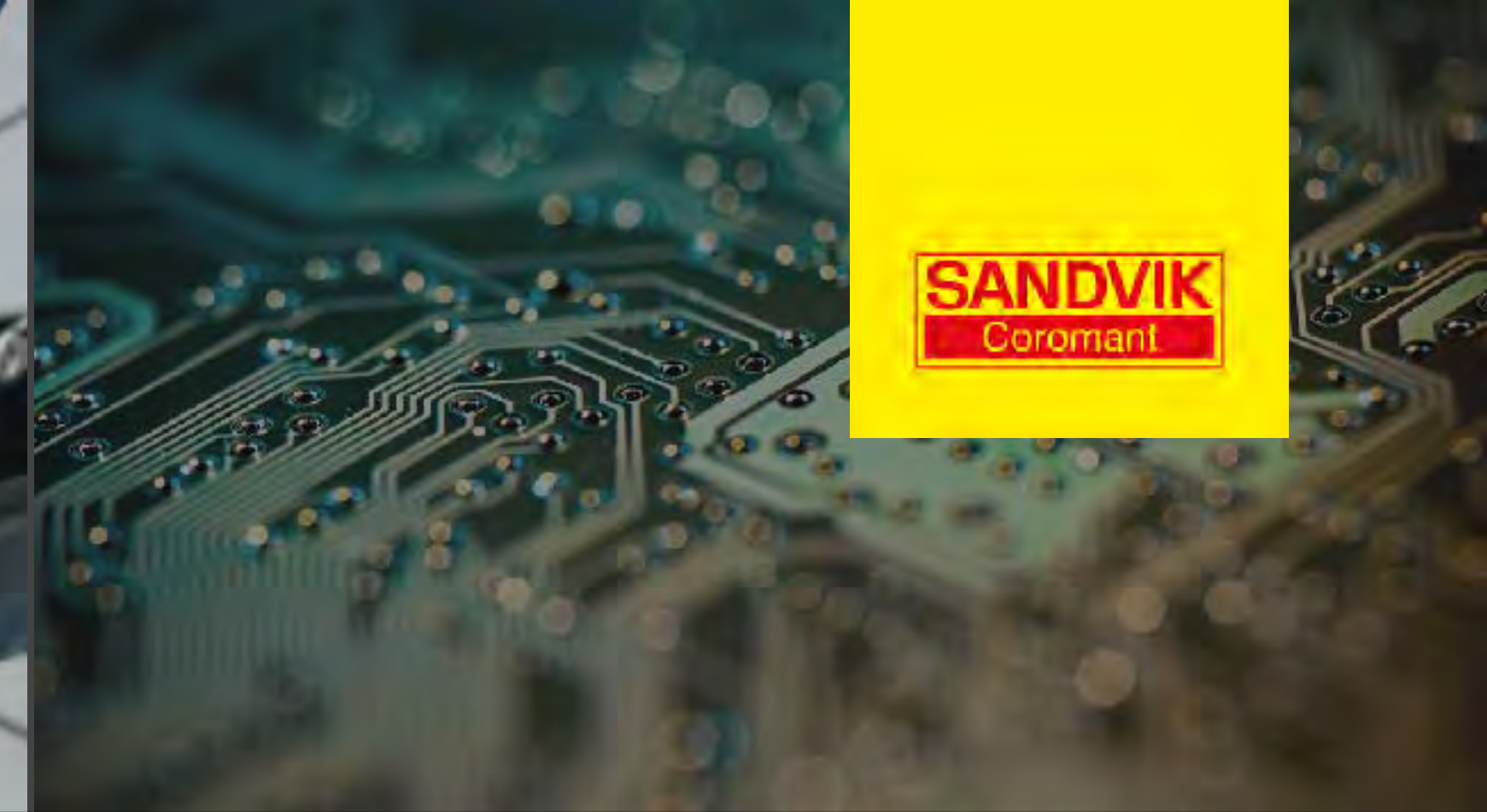
Worldwide presence
(own offices in 45 countries)



7600 employees



2500 new
products/year

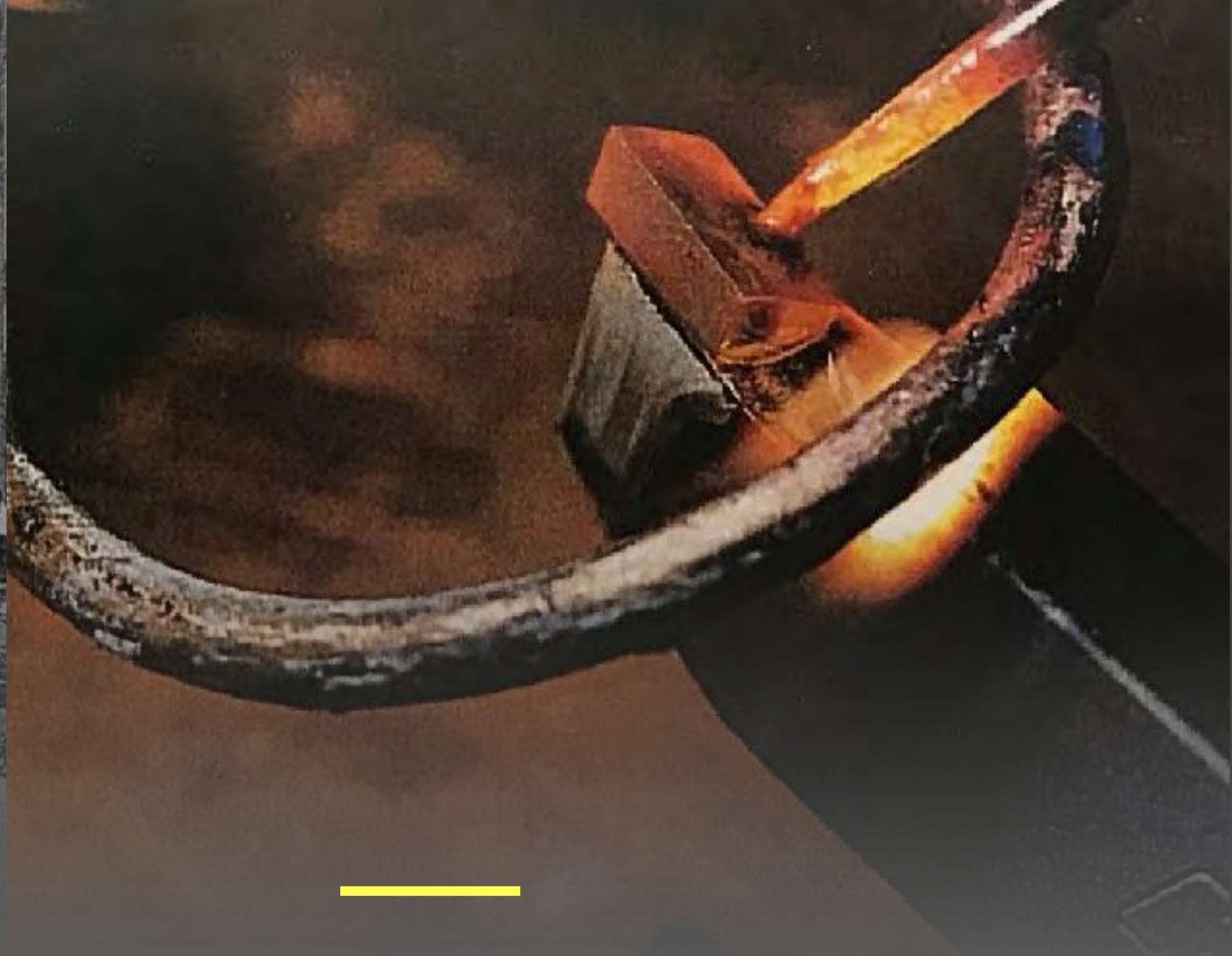




A long heritage

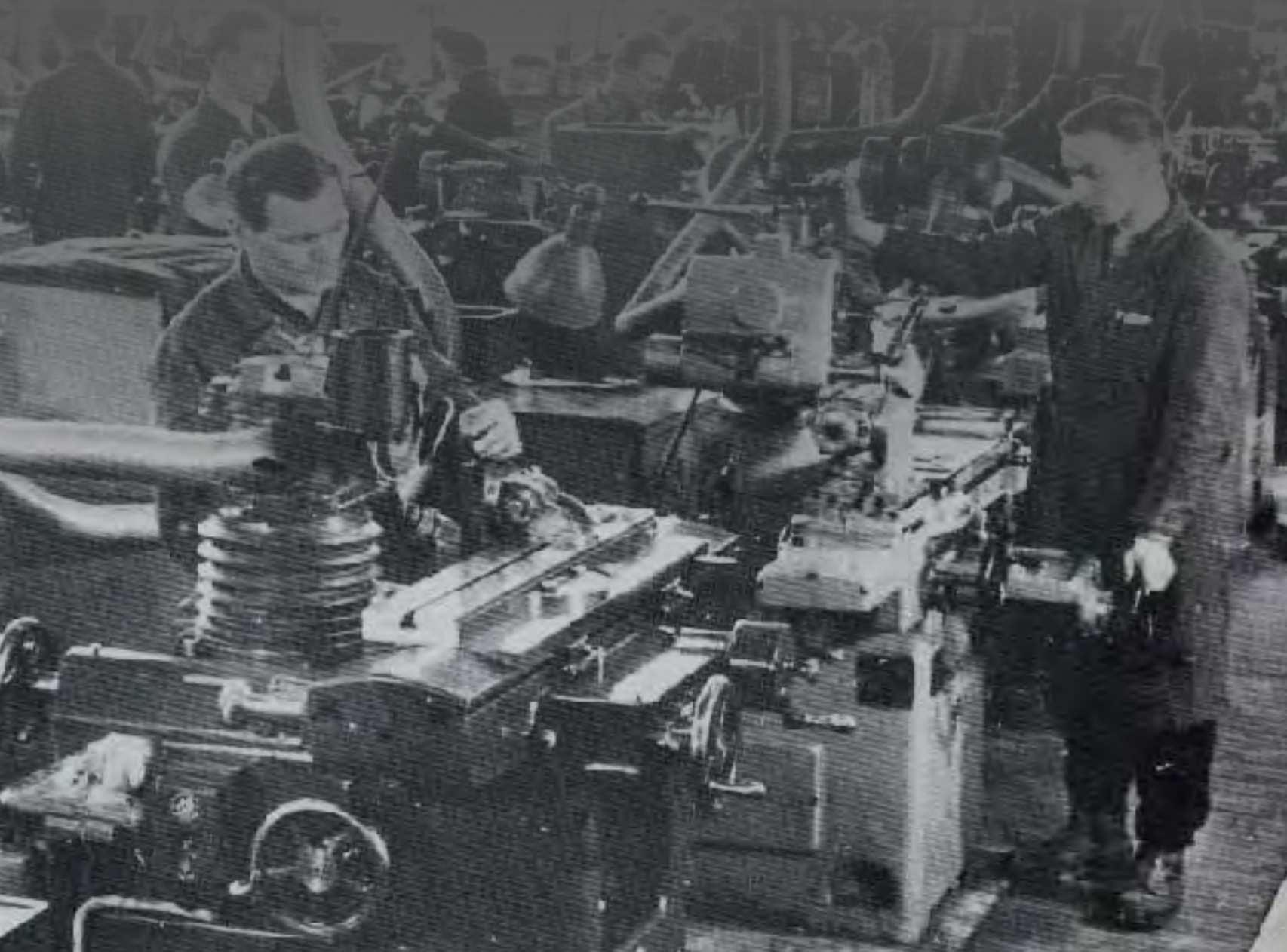
1862

Sandvik is founded. Becomes first in the world to produce steel on an industrial scale using the Bessemer method



1942

The beginning of Sandvik Coromant



2021

Still market leader after 79 years!

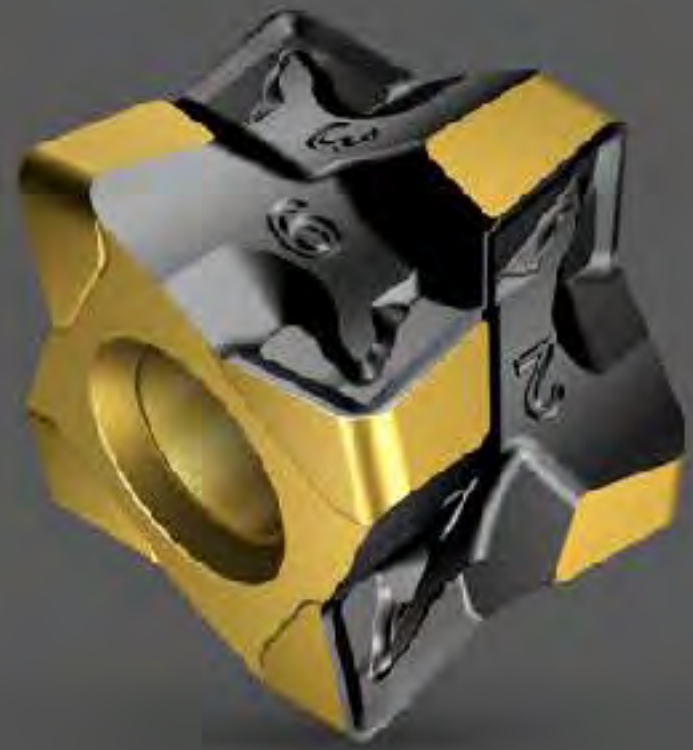


SANDVIK
Coromant



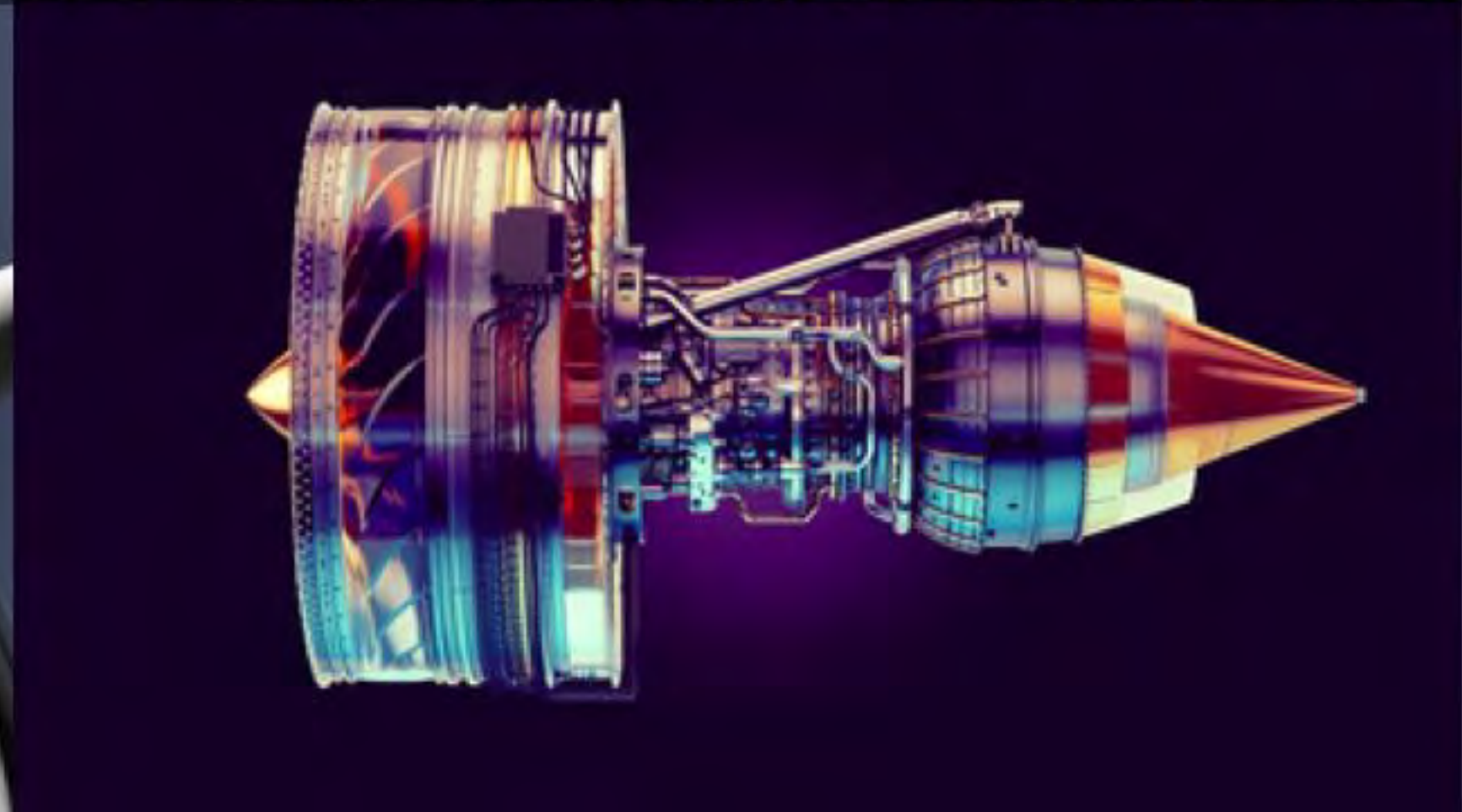
Products

We offer our customers more than 50.000 items



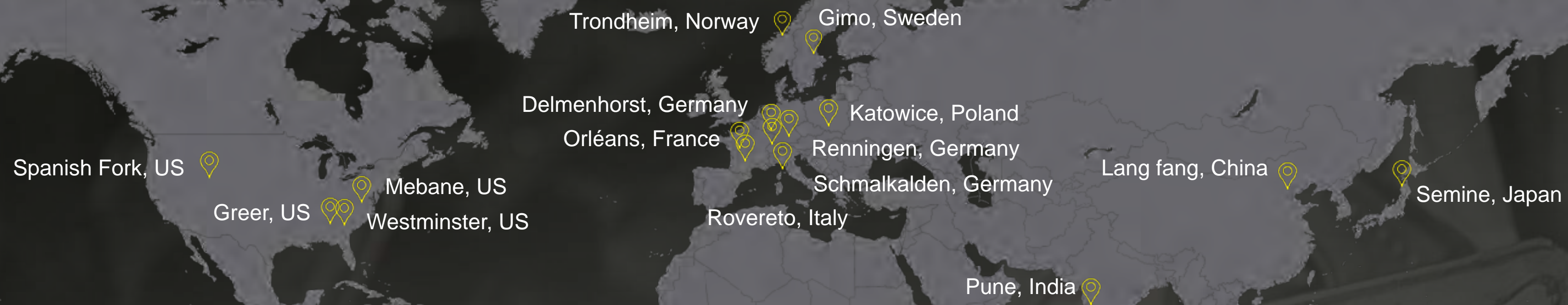
CoroMill® 390

Lower weight increases stability and productivity



The world is changing

and so are we!



4000

Employees



24

Production Units



15

Production Sites





Claes

claes.nord@sandvik.com



Welcome to
Sandvik Coromant

AB Sandvik Coromant
Mossvägen 10
SE-811 81 Sandviken
Phone: +46 (0) 26
Mob: +46 (0) 26
sandvik



Claes Nord
Senior Visitor Experience Specialist

AB Sandvik Coromant
Bruksgatan 3
SE - 747 80 Gimo
Phone: +46 173 84 539
Mob: +46 70 388 16 97
home.sandvikcoromant

Agneta

agneta.hallberg@sandvik.com



Gimo

60°10'20"N 18°10'49"E - Uppsala Län, Östhammars kommun

Gimo, Sweden



Employees

Our most important asset, our people!

1300

Employees

17

Average employment time years

22%

Women



Wilhelm Haglunds Gymnasium

High school for future employees

Equipment

To be able to produce around 30.000 articles we need:

185.000

sqm of productionfloor

>600

CNC-machines

>400

Robots



Global Lighthouse Network

The future of manufacturing is here

We are the future!

Sandvik Coromant Gimo

1000+

Investigated

54

Selected

20

European

1

Swedish



WEF

Sandvik Coromant

GENERAL • 2019-01-10 10:59

World Economic Forum gives recognition to Sandvik Coromant in Gimo

Sandvik Coromant production unit for tools in Gimo has officially been recognized as an advanced Industry 4.0 "lighthouse" by the World Economic Forum. A "lighthouse" site is a world-class production unit that deploys a wide range of Industry 4.0 technologies and at scale, while keeping humans and sustainability at the heart of innovation.

The acknowledgement by the World Economic Forum is prestigious as each lighthouse facility is selected from a survey of over 1,000 manufacturing plants, based on their success in adopting Industry 4.0 technologies and demonstrating tangible benefits.

Gimo has created a digital thread throughout its production processes that is serving to significantly raise productivity. One example is 'touchless changeover', which allows design patterns to be changed automatically, even during unmanned shifts.

Nadine Crauwels, President of Sandvik Coromant, says: "Having our Gimo production unit listed as a lighthouse site by the World Economic Forum not only demonstrates true performance and increased competitiveness, but shows sustainability at the heart of innovation."

"Digital machining is a key Sandvik Coromant offer for customers. Recognition as an advanced adopter of Industry 4.0 endorses our understanding and maturity in this complex area. It also supports the fact that we build digital offers for our customers which deliver tangible business value.", adds V R Vijay Anand, Head of Digital Machining.

To aid the learning and adoption of technologies by other companies, Sandvik Coromant and the rest of the lighthouses in the network have agreed to open their doors and share knowledge with other manufacturing businesses. Examples of other "lighthouses" acknowledged by The World Economic Forum include: the Netherlands, Foxconn (Shenzhen, China), BMW Group (Regensburg Plant, Regensburg, Germany), and Tianjin, China.





WEF Lighthouse

The reasons why we were recognized

Parametric design and manufacturing
1988

Digital thread through production process
2004

MS Power BI Analytics and data collection
2018

Real-time process control system
2019

Impact summary

A clear value in why we did it

+ 55%

Number of pieces
produced per person

- 68%

Batch size

- 89%

Throughput time

+800.000.000

Datapoints are collected every day

PI Coresight och PI Vision





PI Coresight

Wendt Duolift 13

Produktivität 1 Day: 40% (Gauge)

Produktivität 1 Week: 40% (Gauge)

Wendt Duolift 14

Produktivität 1 Day: 40% (Gauge)

Produktivität 1 Week: 40% (Gauge)

Wendt Duolift 15

Produktivität 1 Day: 40% (Gauge)

Produktivität 1 Week: 40% (Gauge)

Wendt Duolift 16

Produktivität 1 Day: 40% (Gauge)

Produktivität 1 Week: 40% (Gauge)

PI Coresight

Wendt duolift 13

Produktivität 1 Day: 40% (Gauge)

Produktivität 1 Week: 40% (Gauge)

Wendt duolift 14

Produktivität 1 Day: 40% (Gauge)

Produktivität 1 Week: 40% (Gauge)

Wendt duolift 15

Produktivität 1 Day: 40% (Gauge)

Produktivität 1 Week: 40% (Gauge)

PI Vision

Starna:MC 533/TWIN:14_1_2

Active Tool number 1: 8301
Live InChk: No Data
Previous Tool Nbr 1: No Data
ToolTime: No Data

Current in outline: 4 200 s
Current in outline: 2 643 s

Media Consumption: Compressed Air 1, Temp Air 1, Totalizer Air 1, Compressed Air 2, Temp Air 2, Totalizer Air 2

Energy Consumption: Live Consumption, Total Energy Consumption, Energy Mode, Energy mode Not Active

Machine Status: No or Unable to classify Stop Loss

PI Vision

Sandvik Coromant Gimo

True Digitalisation TODAY

Active Tool number 1: 1516
Stop Reason: No or Unable to classify Stop Loss

Active Tool number 1: 98
Stop Reason: No or Unable to classify Stop Loss

Active Tool number 1: 514
Stop Reason: No or Unable to classify Stop Loss

Active Tool number 1: 1001
Stop Reason: No or Unable to classify Stop Loss

Production: 2478, 1 592, Remaining Tool Life: 2 176%

PI Vision

Sandvik Coromant Gimo

From sensor to insight

Collect, Store and real time scanning analytics from machines and sensors

Machine status is calculated and contextualized from machine sensor signals

200+ signals are processed per day

1200+ variables (scanned) per second

1200+ variables for deeper analysis and insights

PI Vision

Sandvik Coromant Gimo

From sensor to insight

SAP EAM ID: Starna:MC 533/TWIN:14_1_1

SA EAM ID: Starna:MC 533/TWIN:14_1_2

Tool Information: Active Tool Nbr, Previous Tool Nbr, Remaining Tool Life

Machine Status: No or Unable to classify Stop Loss

PI Coresight

Carto - Overview

578	587	586	567	568	557	556	547	546
579	585	584	565	564	555	554	545	544
0			100		26			
597	583	582	563	562	553	552	543	542
596	581	580	561	560	551	550	541	540

PI Vision

Gimo Capto Overview

HEUN 1_1 KPI_TUG: 100%	HEUN 1_3 KPI_TUG: 100%	KPI_TUG: 65%	KPI_TUG: 5,555%	Starna S5G KPI_TUG: 97,222%
HEUN 1_2 KPI_TUG: 100%	Schaudi 2 KPI_TUG: 0%	KPI_TUG: 98,611%	KPI_TUG: 0%	17_1 KPI_TUG: 77,222%

Wendt Duolift 13

När någon av dessa lampor är gula eller röda, tänds en lampa ute vid maskin för spindel/skärpmotor.

Bitar sedan början **10659 Antal**
 Upptid senaste 24h **46,34 %**

25,15 C° Kylvatten temp
 2,30 m3/h Luft flöde

O-Spindel obj:600312
 Varvtal Ström
 623 rpm 1,09 A

Skärpmotor
 fastvarvtal
 3313 rpm

U-Spindel
 Varvtal Ström
 -2 rpm 0,00 A

Hydraulolja nivå **69,50 %**

O-Spindel

- Effektivvärde 19,58 mg
- Vibration 0,18 mm/s RMS
- Obalans 0,10 mm/s RMS
- Lagerskada 4,29 mg

Skärpmotor

- Effektivvärde 11,01 mg
- Vibration 0,22 mm/s RMS
- Obalans 0,02 mm/s RMS
- Lagerskada 2,02 mg
- Glapp 0,12 mm/s RMS

U-Spindel

- Effektivvärde 13,62 mg
- Vibration 0,19 mm/s RMS
- Obalans 0,09 mm/s RMS
- Lagerskada 3,31 mg

Wendt Duolift 14

När någon av dessa lampor är gula eller röda, tänds en lampa ute vid maskin för spindel/skärpmotor.

Bitar sedan början **12414 Antal**
 Upptid senaste 24h **38,60 %**

26,33 C° Kylvatten temp
 1,80 m3/h Luft flöde

O-Spindel obj:600313
 Varvtal Ström
 618 rpm 1,01 A

Skärpmotor
 fastvarvtal
 3313 rpm

U-Spindel
 Varvtal Ström
 -2 rpm 0,03 A

Hydraulolja nivå **86,92 %**

O-Spindel

- Effektivvärde 28,96 mg
- Vibration 0,30 mm/s RMS
- Obalans 0,15 mm/s RMS
- Lagerskada 3,29 mg

Skärpmotor

- Effektivvärde 15,16 mg
- Vibration 0,17 mm/s RMS
- Obalans 0,02 mm/s RMS
- Lagerskada 2,31 mg
- Glapp 0,07 mm/s RMS

U-Spindel

- Effektivvärde 16,34 mg
- Vibration 0,15 mm/s RMS
- Obalans 0,09 mm/s RMS
- Lagerskada 4,12 mg

Wendt Duolift 15

När någon av dessa lampor är gula eller röda, tänds en lampa ute vid maskin för spindel/skärpmotor.

Bitar sedan början **2843 Antal**
 Upptid senaste 24h **17,52 %**

25,14 C° Kylvatten temp
 0,99 m3/h Luft flöde

O-Spindel obj:600314
 Varvtal Ström
 581 rpm 1,92 A

Skärpmotor
 fastvarvtal
 3313 rpm

U-Spindel
 Varvtal Ström
 577 rpm 1,47 A

Hydraulolja nivå **84,83 %**

O-Spindel

- Effektivvärde 23,54 mg
- Vibration 0,22 mm/s RMS
- Obalans 0,08 mm/s RMS
- Lagerskada 4,49 mg

Skärpmotor

- Effektivvärde 15,86 mg
- Vibration 0,22 mm/s RMS
- Obalans 0,05 mm/s RMS
- Lagerskada 11,77 mg
- Glapp 0,07 mm/s RMS

U-Spindel

- Effektivvärde 15,96 mg
- Vibration 0,18 mm/s RMS
- Obalans 0,08 mm/s RMS
- Lagerskada 2,64 mg

Wendt Duolift 16

När någon av dessa lampor är gula eller röda, tänds en lampa ute vid maskin för spindel/skärpmotor.

Bitar sedan början **25437 Antal**
 Upptid senaste 24h **0,00 %**

24,86 C° Kylvatten temp
 1,49 m3/h Luft flöde

O-Spindel obj:600315
 Varvtal Ström
 0 rpm 0,00 A

Skärpmotor
 fastvarvtal
 3313 rpm

U-Spindel
 Varvtal Ström
 0 rpm 0,00 A

Hydraulolja nivå **84,35 %**

O-Spindel

- Effektivvärde 15,80 mg
- Vibration 0,16 mm/s RMS
- Obalans 0,07 mm/s RMS
- Lagerskada 50,90 mg

Skärpmotor

- Effektivvärde 9,90 mg
- Vibration 0,14 mm/s RMS
- Obalans 0,02 mm/s RMS
- Lagerskada 2,02 mg
- Glapp 0,07 mm/s RMS

U-Spindel

- Effektivvärde 12,00 mg
- Vibration 0,15 mm/s RMS
- Obalans 0,10 mm/s RMS
- Lagerskada 45,04 mg

Microsoft Power BI

Data made easy to understand for everyone



Power BI SMS Coromant GY

Exportera | Dela | Chatta i Teams | Kommentera

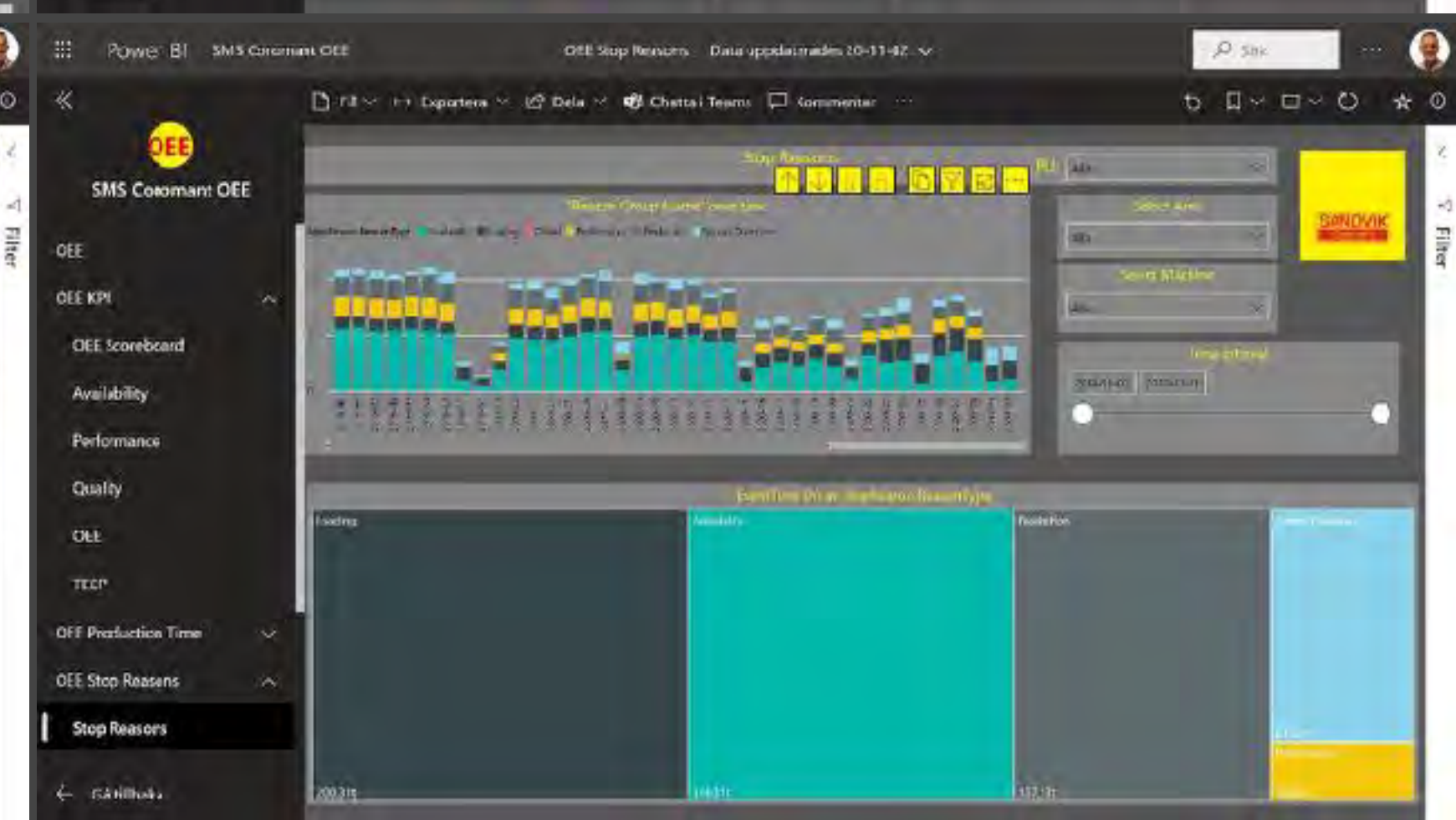
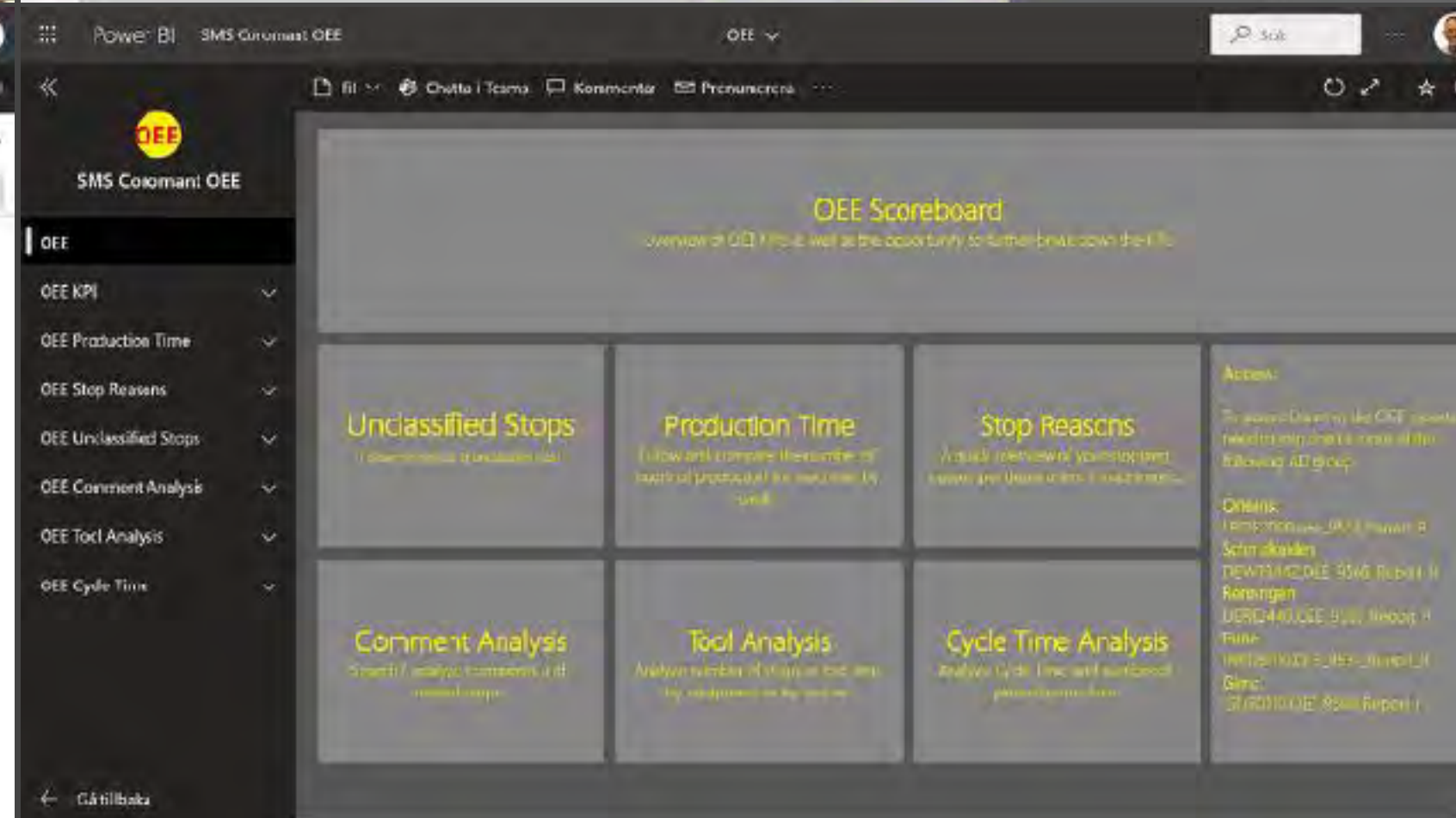
AC Nr	Org Datum	Fin Start	Organ Status	FB Status	mentars	Beställning	Lagbeteckning	Titel
200008	2020-11-03	2021-01-07	4	Varier	4	Motordrivna tillverkningsmaskiner för 11 maskininteriörer	1001	1001
200009	2020-11-03	2021-01-07	2	Varier	2	11 stycken maskininteriörer	1001	1001
200010	2020-11-03	2021-01-07	3	Varier	3	Hyllor till maskininteriörer	1001	1001
200011	2020-11-03	2021-01-07	4	Varier	4	Hyllor till maskininteriörer	1001	1001
200012	2020-11-03	2021-01-07	2	Varier	2	Hyllor till maskininteriörer	1001	1001
200013	2020-11-03	2021-01-07	3	Varier	3	Hyllor till maskininteriörer	1001	1001
200014	2020-11-03	2021-01-07	2	Varier	2	Hyllor till maskininteriörer	1001	1001
200015	2020-11-03	2021-01-07	2	Varier	2	Hyllor till maskininteriörer	1001	1001
200016	2020-11-03	2021-01-07	2	Varier	2	Hyllor till maskininteriörer	1001	1001
200017	2020-11-03	2021-01-07	2	Varier	2	Hyllor till maskininteriörer	1001	1001
200018	2020-11-03	2021-01-07	2	Varier	2	Hyllor till maskininteriörer	1001	1001
200019	2020-11-03	2021-01-07	2	Varier	2	Hyllor till maskininteriörer	1001	1001
200020	2020-11-03	2021-01-07	2	Varier	2	Hyllor till maskininteriörer	1001	1001

Power BI SMS Coromant GY

GVM5 Schema

Välj inställning: Alla, Alla, Alla

Arbetsordrarsnummer	Beställningsdatum	Org. Status	Maskin Status	AD Dnrkostnad	Arbetsordrarsnummer
102180					Prolog - maskininteriörer (inklusive tillbehör) / GVM5
102181					Prolog - maskininteriörer (inklusive tillbehör) / GVM5
102182					Prolog - maskininteriörer (inklusive tillbehör) / GVM5
102183					Skapningsordrar jobb - GVM5 2020
102184					Skapningsordrar jobb - GVM5 2020
102185					Skapningsordrar jobb - GVM5 2020
102186					Skapningsordrar jobb - GVM5 2020
102187					Skapningsordrar jobb - GVM5 2020
102188					Skapningsordrar jobb - GVM5 2020
102189					Skapningsordrar jobb - GVM5 2020
102190					Skapningsordrar jobb - GVM5 2020
102191					Skapningsordrar jobb - GVM5 2020
102192					Skapningsordrar jobb - GVM5 2020
102193					Skapningsordrar jobb - GVM5 2020
102194					Skapningsordrar jobb - GVM5 2020
102195					Skapningsordrar jobb - GVM5 2020
102196					Skapningsordrar jobb - GVM5 2020
102197					Skapningsordrar jobb - GVM5 2020
102198					Skapningsordrar jobb - GVM5 2020
102199					Skapningsordrar jobb - GVM5 2020
102200					Skapningsordrar jobb - GVM5 2020
102201					Skapningsordrar jobb - GVM5 2020
102202					Skapningsordrar jobb - GVM5 2020
102203					Skapningsordrar jobb - GVM5 2020
102204					Skapningsordrar jobb - GVM5 2020
102205					Skapningsordrar jobb - GVM5 2020
102206					Skapningsordrar jobb - GVM5 2020
102207					Skapningsordrar jobb - GVM5 2020
102208					Skapningsordrar jobb - GVM5 2020
102209					Skapningsordrar jobb - GVM5 2020
102210					Skapningsordrar jobb - GVM5 2020



Qlick Sense

Data made easy to access for everyone

MIA

Prev. Year YTD Current Selection

21	35	MINOR INJURIES	251
304	493	NEAR MISSES	1706
742	133	HAZARDS	290

MIA calendar

Occurrences

Date	Type of Occurrence	Title	Occurrence Manager	Occurrence Department
1920-12-05	Risk observation	Risk för kränkande särbehandling	Jürgen Lindström	GH
1920-12-05	Risk observation	Kränkande särbehandling	Ulfrik Jönvall	GHPC - Beslaggrupp
1920-11-25	Risk observation	GH-utöver GUPC	Daniel Delind	GHPC - Beslaggrupp
1920-11-05	Risk observation	Brandöversikt enligt intressets betydelse	Urban Andersson	GHPCS - PVD delaggrupp

Gimo Production System KPIs

Year: This Week Today Last 7 Days Last Week

Quality KPI (R200...): 82%

COGS DELIVERED...: 110%

STD DELIVERIES...: 80%

DP SPECIÄL...: 100%

Data in this sheet is based on delivered orders

GH Production Rejects

Top 5 rejections (Sorted by article family and reject location)

Production Line Groups

- GH Blank
- GH Excluded
- GH Misc
- GH Special
- GH Standard
- GH IVY
- No Problems Group

Top 5 rejections (Sorted by article family and reject location)

Top 5 rejections (Sorted by reject description and comments by operators)

Gimo Production System - Quality

Year: This Week Today Last 7 Days Last Week

Grinding

- Soft G...: 0.00%
- Surface Gr...: 0.15%
- Secret Room: 0.27%

Pre-treatment

- Brushing: 0.01%
- Bulldog CVD: 0.16%
- Bulldog PVD: 0.43%

Coating & Post-treatment

- CVD: 1.03%
- PVD: 0.28%
- Post treat...: 0.16%
- PVD de-chau...: 0.00%

Blank Production

- Pressing: 2.23%
- Inspection: 6.32%
- Sintering: 0.18%
- Powder: 0.11%

Open customer complaints

Complaint	Standard/Spec.	Team	Article Code	Reason	IOAR (req'd)	Com.	HTGH (0-3)	HTGH (7-14)	HTGH (15-30)

Gimo Production System - Locked WIP

Total locked WIP: 124k

Grinding: 12k (75.8 grinding)

Pre/Post treatment: 1k (Sweet room), 0k (Brushing)

Coating: 0k (Post treat), 3k (CVD chubest), 0k (CVD lab)

Blank production: 11k (Blank lab), 5k (Method)

Pressing: 2k, Sintering: 0k, Blank insp: 72k

Agathon: 2k, V08: 0k, Bulldog CVD: 3k

WPL: 1k

PVD chubest: 7k, PVD Coating: 0k

Gimo Production System - Reports

Year: This Week Today Last 7 Days Last Week

Grinding

- Soft g...: 253
- Surface gr...: 468k ▲41
- Secret Room: 124k ▼-1

Pre-treatment

- Picking WIP: 416k
- Brushing: 479k ▼-1
- Bulldog CVD: 1.6k ▼-3
- Bulldog PVD: 1.9k ▲77

Coating & Post-treatment

- CVD: 190k ▼-4
- Post treat... WIP: 151k ▲1
- PVD: 388k ▲1
- PVD de-chau... WIP: 375k

Blank Production

- Pressing: 1.138k ▲
- Inspection: 1.132k
- Sintering: 1.273k
- Powder: 1.132k

Press Tool

Produced Quantity vs Order Intake and Target for DIE

Produced Quantity vs Order Intake and Target for PUNCH

Reparation Quantity

PRESTIDOLPOS	Q	POSITIONDESCR	Q	INSERTION
1		INSTRUM		525
3		REPAR		38.034
4		EXCEPT		22.100
6		TESTING		0.408

Tracking Late Orders

Number of Late WIP Orders right now

ORDER TYPE

Order Number	Article Code	Operation	QIS2 oper	QPD	Revs. In Queue	Status	Oper. Priority
00994533	CO-NH-000-0002-CM-1144	LINA	ANGLINA	-17	0	Booked	1
00994531	CO-NK-000-0004-CR-1135	BULLDOG 30 CVD	BCOG 30 IR	5	7	Buffer	1
00994400	CO-NL-1373-0100-CP-0793	RIVEL	NOLETT	28	7	Available	1
00991034	R300-1006-31H-XL-3040	CoronaC	COROMATC	10	18	Buffer	1



SANDVIK
Coromant

SANDVIK
Coromant

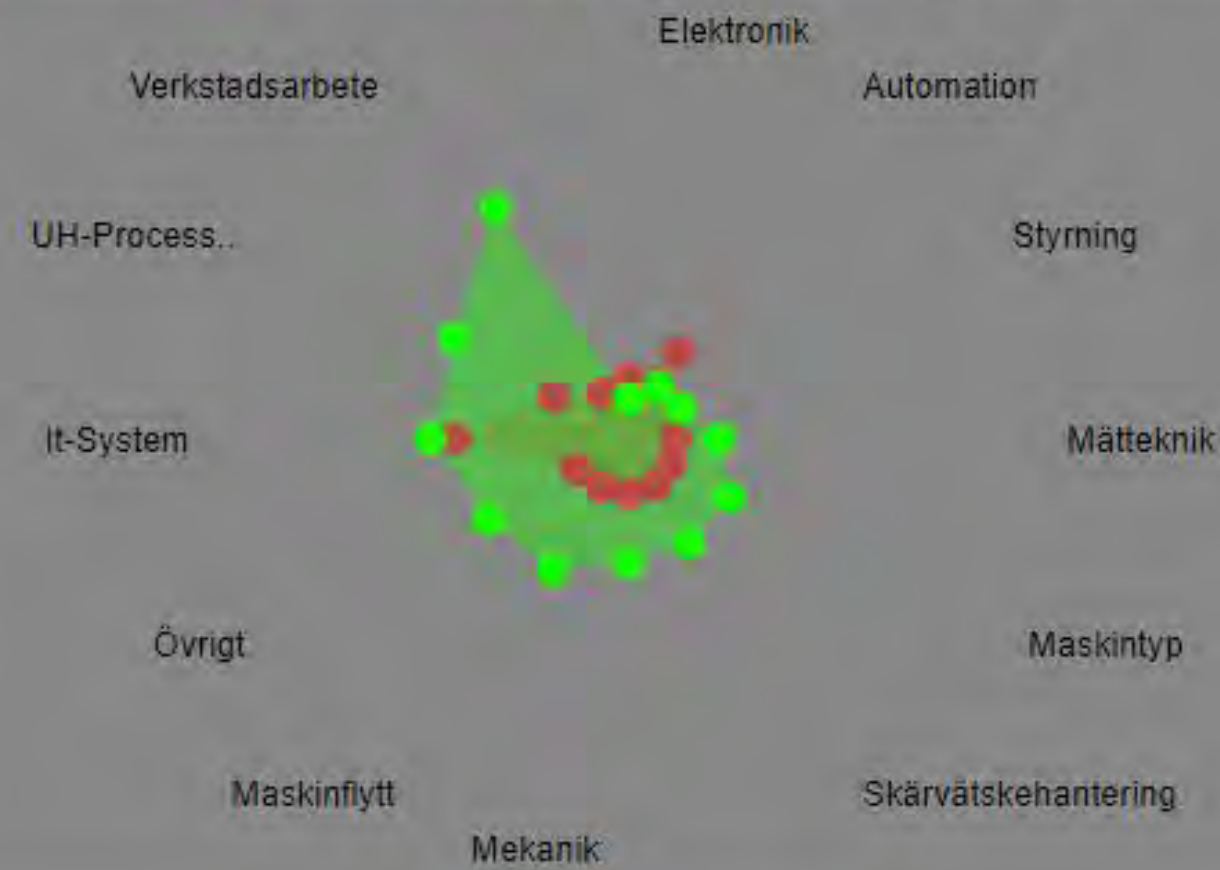
Team Competence Matrix

Skills and competences needed for the future

Kompetensmatris

Medelvärde per kategori

● Önskat antal ● Genomsnitt för Antal personer med 2 eller högre per Kompetens



Välj Kategori

Övrigt	UH-Processen	Skärvätskehant...	Mekanik	Maskinflytt	Elektr...	Auto...
Verkstadsarbete	Styrning	Mätteknik	Maskintyp	It-System		

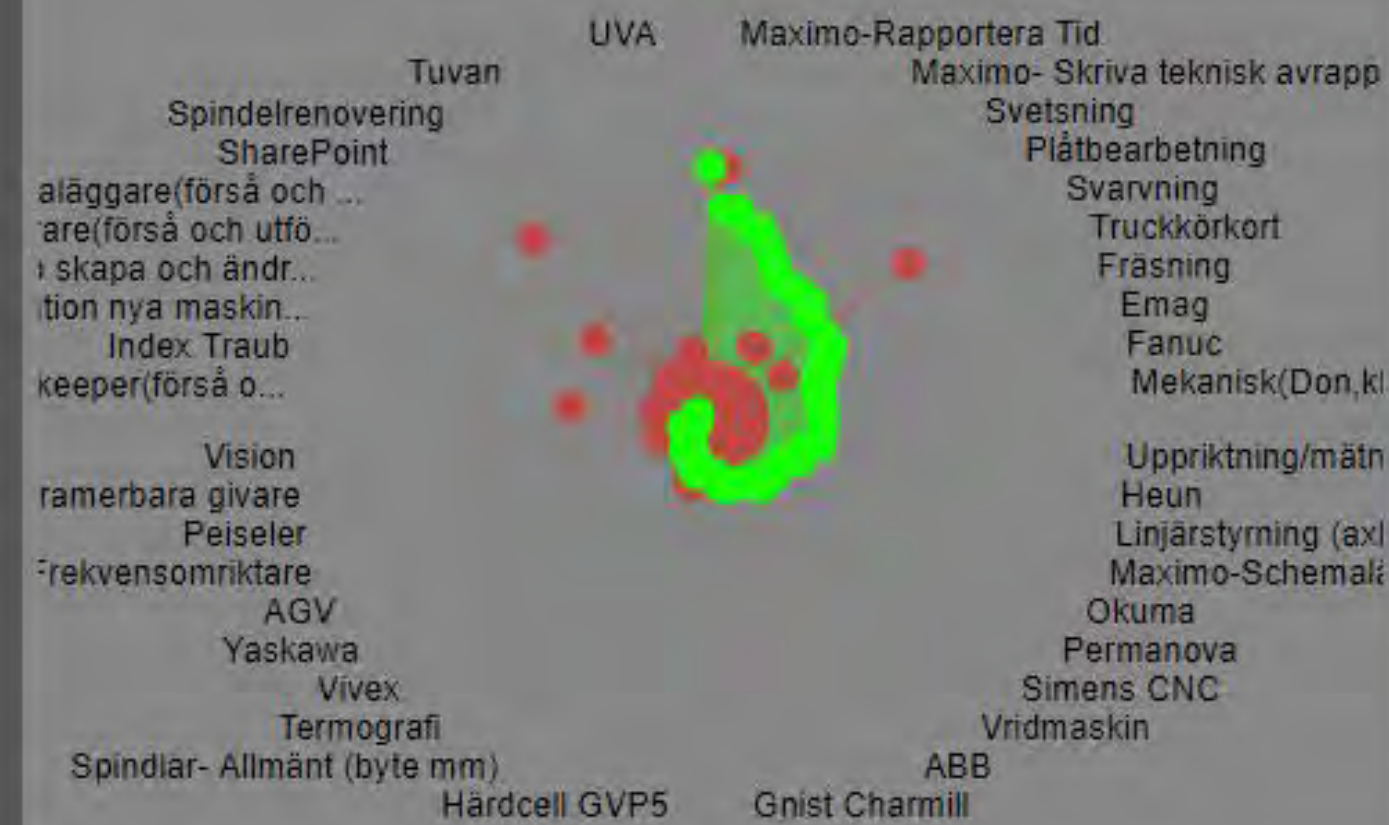


Kompetenser

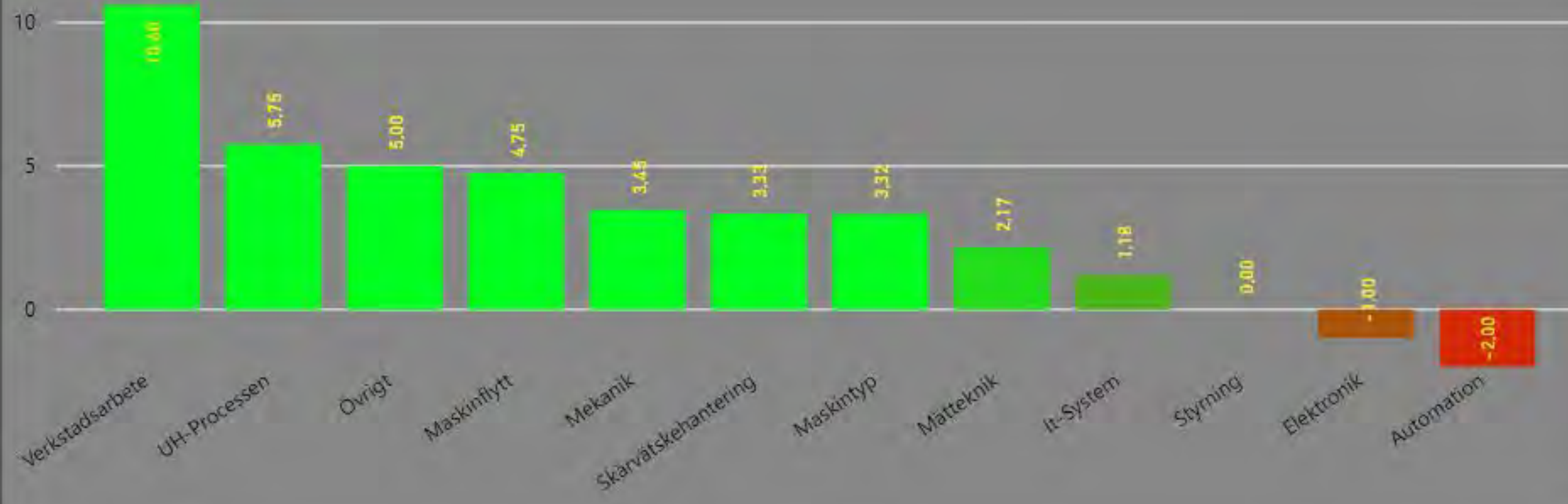
Kategori	Kompetens	Antal personer med 2 eller högre	Önskat antal	Diferens Verkligt - Önskat
Verkstadsarbete	Plåtbearbetning	14	1	13
Verkstadsarbete	Svetsning	15	3	12
Verkstadsarbete	Svarvning	14	3	11
Maskinflytt	Truckkörkort	13	3	10
Verkstadsarbete	Fräsning	12	3	9
Maskintyp	Emag	11	3	8

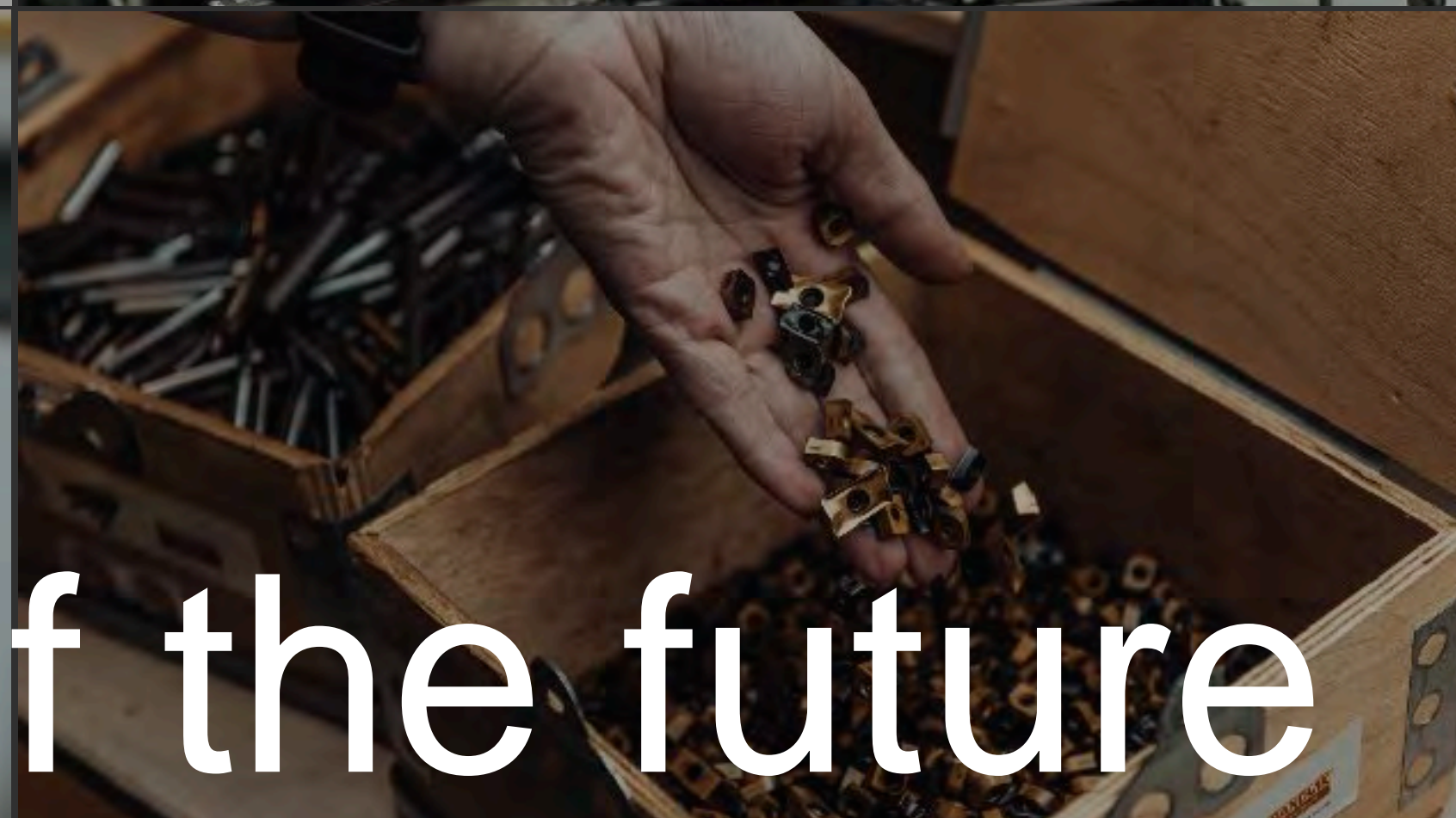
Antal per kompetens

● Önskat antal ● Verkligt antal



Kompetenser

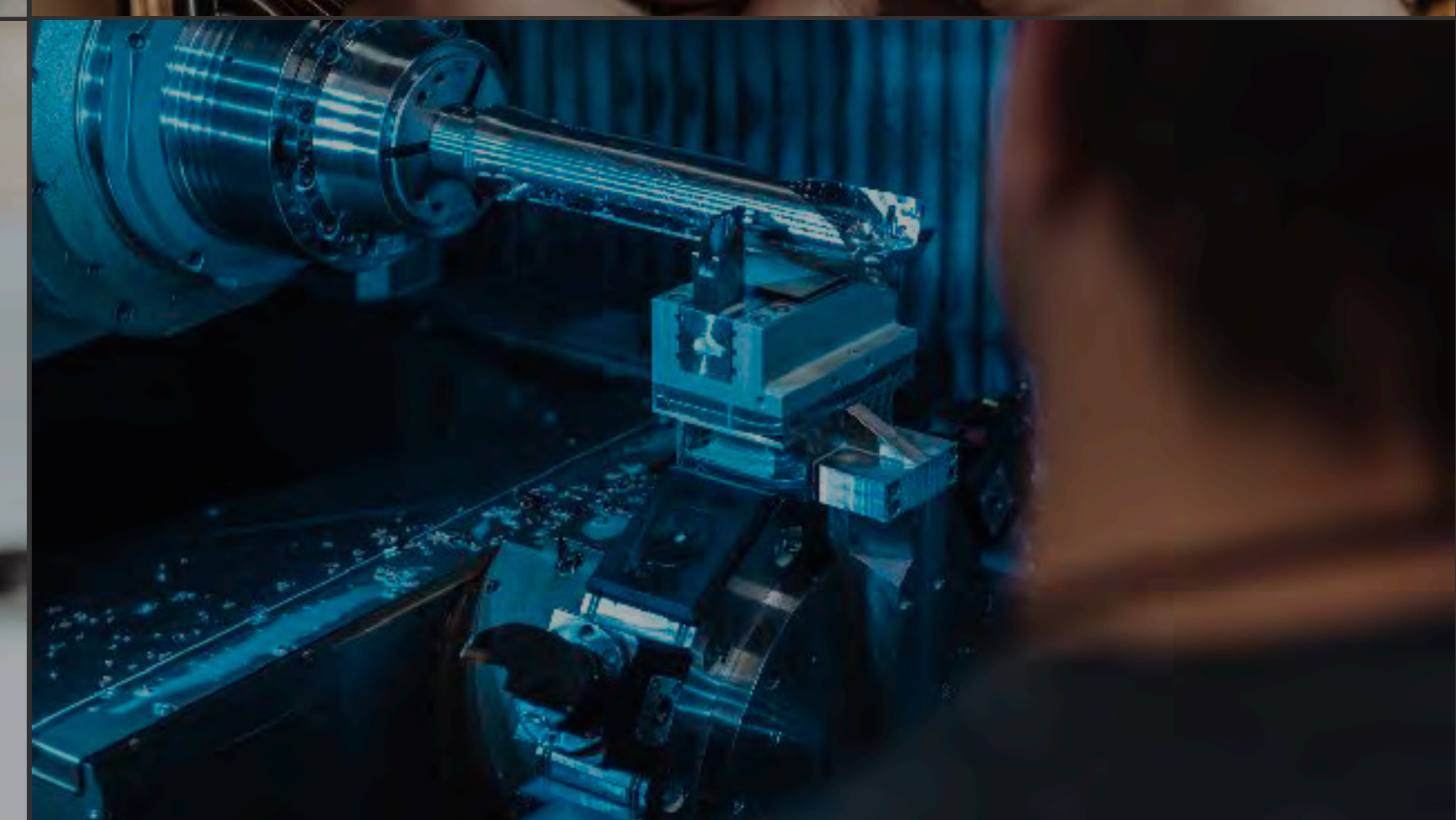
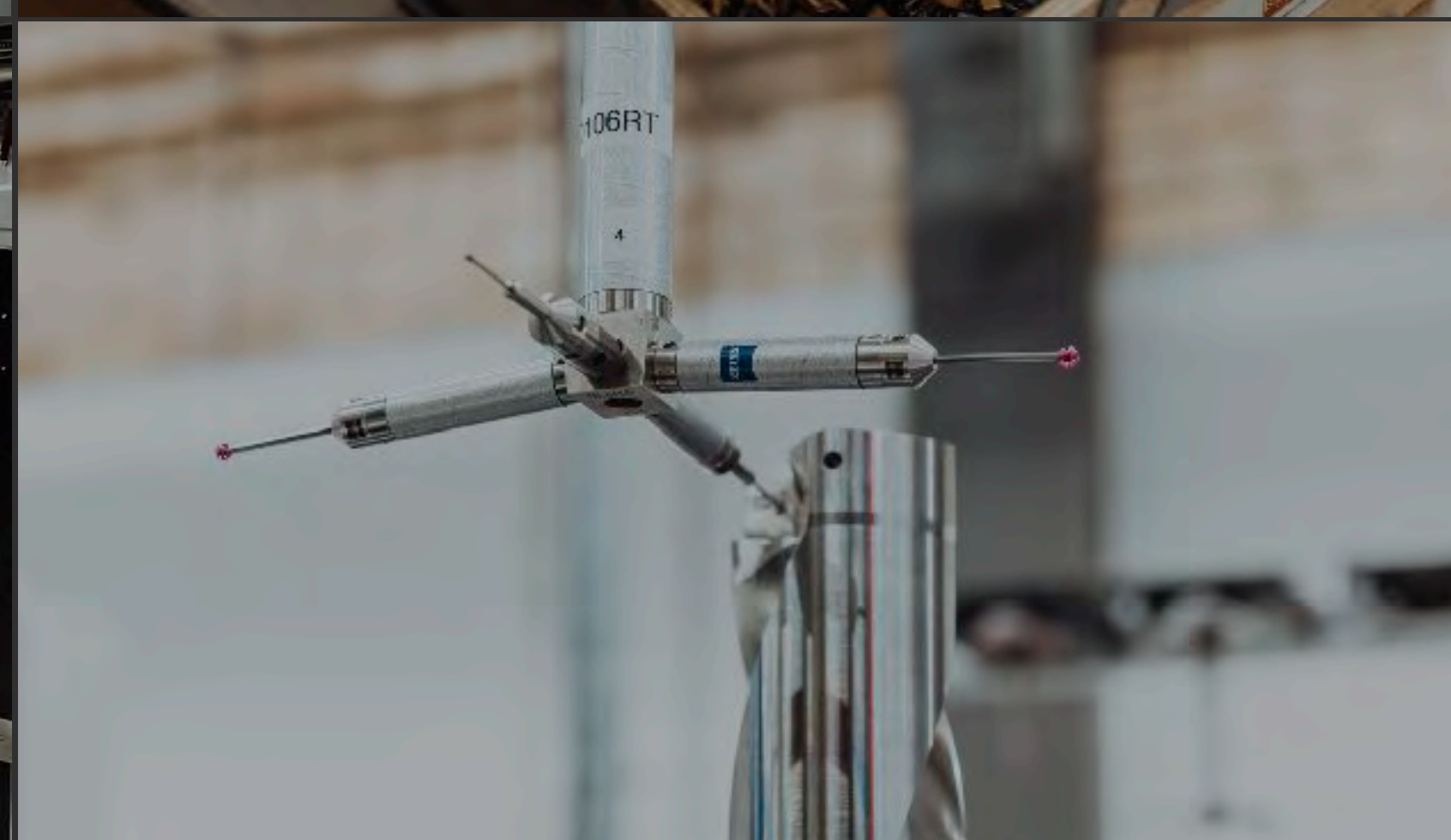




Factory of the future



A short summary





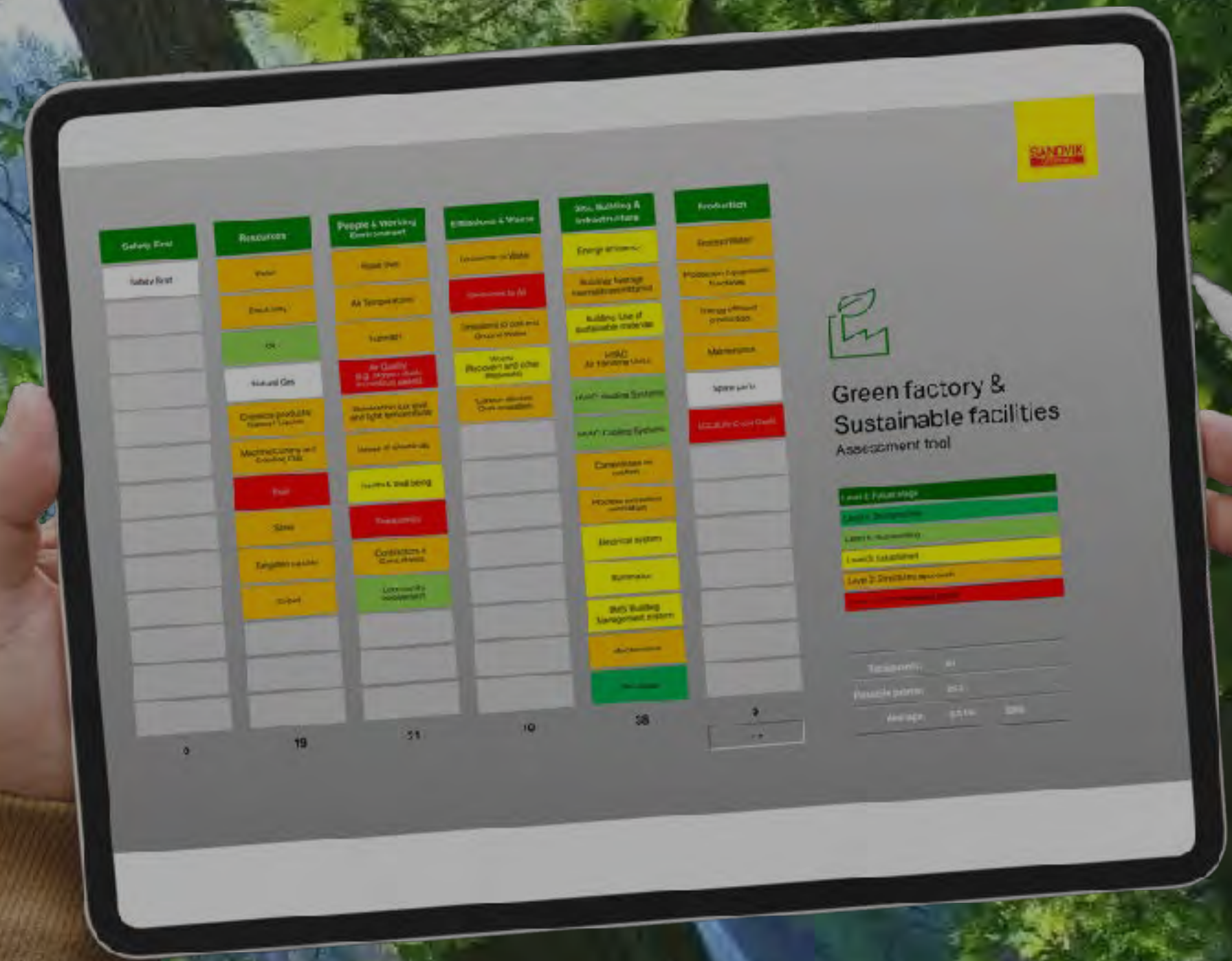
SANDVIK
Coromant

Sustainability

We care for people and the world we live in!

Innovation

Green Factory and Sustainable facilities



Circularity

True sustainability means circularity



Shaping the future together

We will use technology and innovation to drive the shift towards 2030



People

Planet

Profit



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