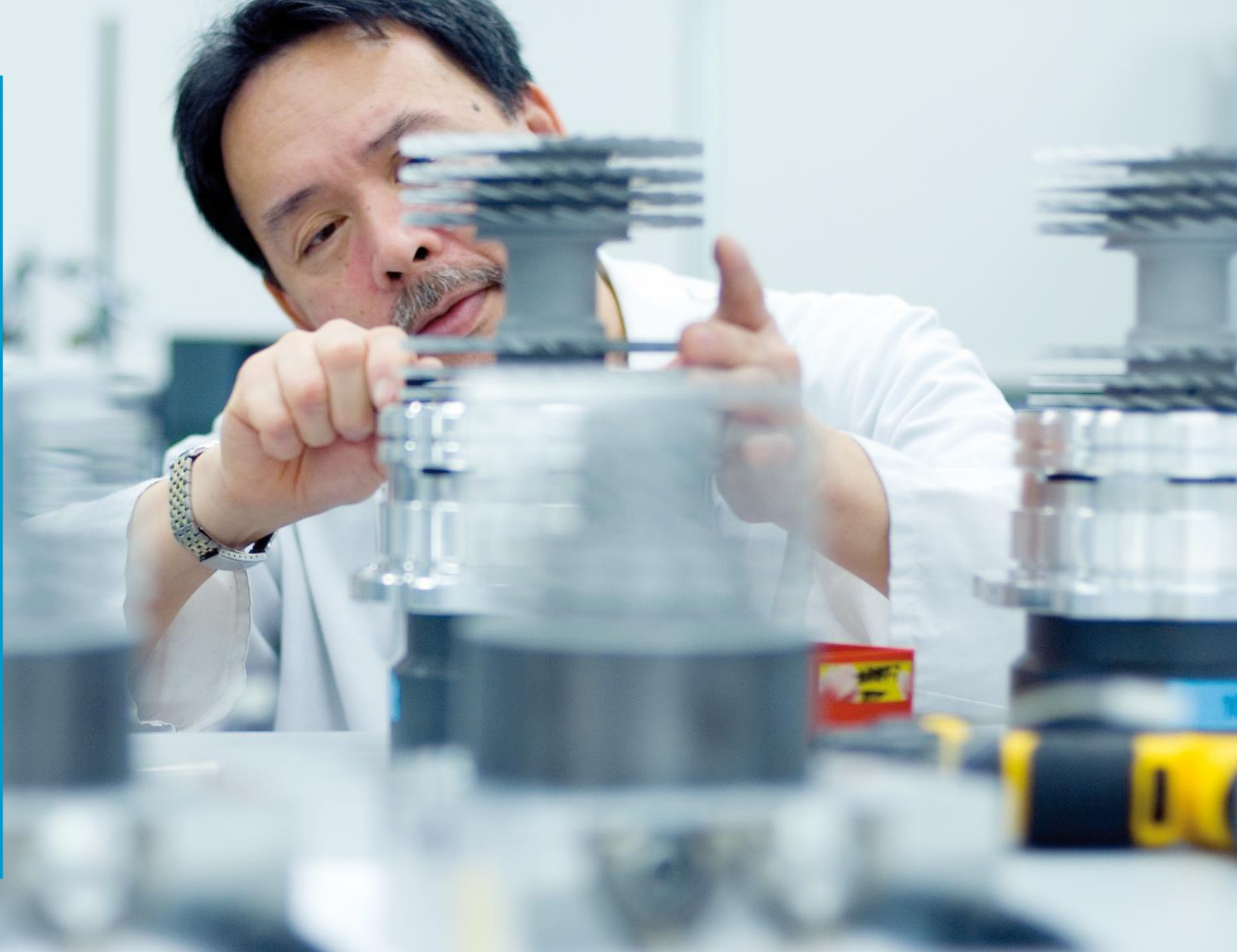


# VACUUM TECHNIQUE

Atlas Copco  
Capital Markets Day 2016

Geert Follens  
Business Area President

*Atlas Copco*



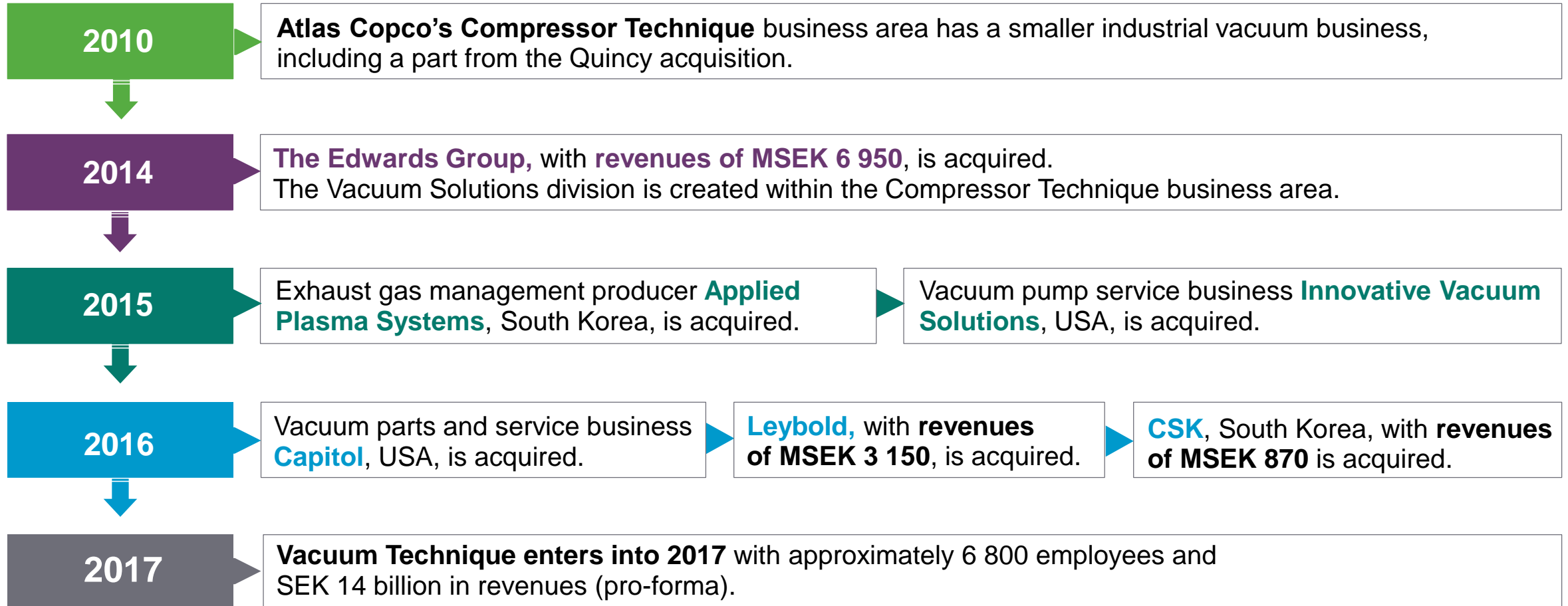
# AGENDA

1. Facts in Brief
2. Vacuum Technique  
– Way forward
3. Semiconductor industry
4. General industry
5. Sustainable vacuum solutions
6. Service offer
7. Summary



# *FACTS IN BRIEF*

# TIME LINE



# FACTS IN BRIEF

## Edwards / Vacuum solutions division 2015



**Headquarters:** Burgess-Hill - UK



**Employees:** 3 903 + 759 add. workforce  
(2015)



**Revenue:** MSEK 9 955  
(2015)

### Business description

- A leading developer and manufacturer of vacuum products, exhaust management systems and related services
  - Strong presence in the semiconductor industry



# FACTS IN BRIEF

## Keybold overview



**Headquarters:** Cologne, Germany



**Employees:** > 1 600  
(2015)



**Revenue:** MCHF 360 (MSEK 3 150)  
(2015)

### Business description

- Leader in industrial vacuum with significant presence in high vacuum



**DRYVAC**  
Dry Compressing  
Screw Pumps



**TURBOVAC i X**  
Mechanical  
Turbomolecular Pumps



**TMP MAG Line**  
Turbomolecular Pumps

#### TRIVAC

Rotary Vane  
Vacuum Pumps



**SOGEVAC**  
Rotary Vane  
Vacuum Pumps



**RUVAC**  
Roots Vacuum  
Pumps



**TURBOSTREAM**  
Turbo radial Blowers



**TMP Classic Line**  
Turbomolecular Pumps

#### SCROLLVAC

Dry Compressing  
Scroll Vacuum Pumps



**COOLVAC**  
Cryo pumps



**SCREWLINE**  
Dry Compressing Screw  
Vacuum Pumps

**SYSTEMS**  
Standardized & customized



# FACTS IN BRIEF

## CSK overview



**Headquarters:** Gyeonggi-do, South Korea



**Employees:** 400  
(2015)

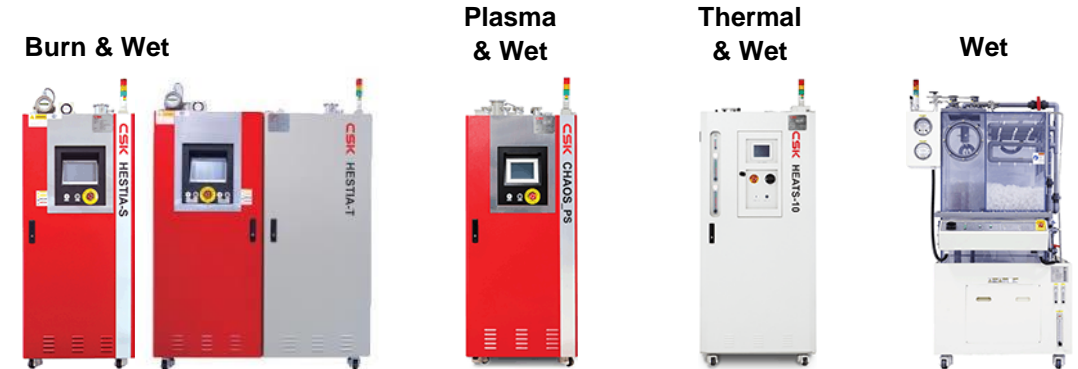


**Revenue:** BKRW 124.5 (MSEK 870)  
(2015)

### Business description

- A leading supplier of exhaust management and delivery systems in the Korean market, focused on the semiconductor market

### • Exhaust management systems



### • Delivery systems

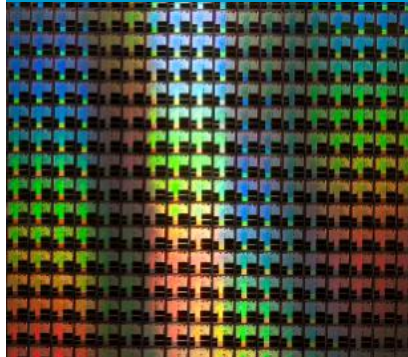


# VACUUM TECHNIQUE

Vacuum products



Semiconductor



Flat panel displays



Solar panels



Metallurgy



Exhaust management systems



Food & beverages



Packaging



Conveying and assembly

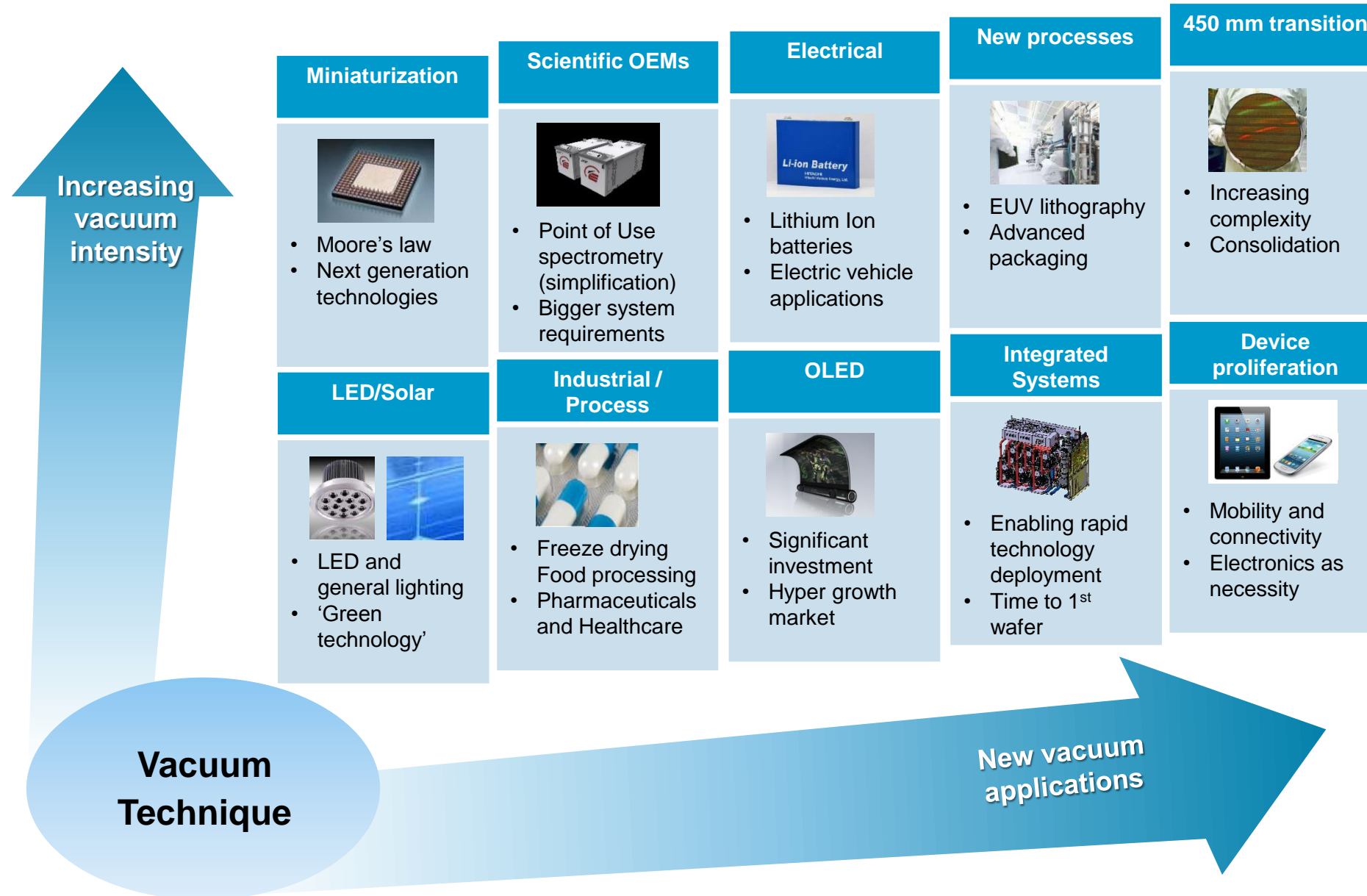


...and more





# VACUUM – A GROWING MARKET



# MARKET COVERAGE

## Vacuum Technique

Market segmentation	Vacuum		
	Rough, process and industrial vacuum	Semiconductor	High and ultra high vacuum
Pressure range (absolute pressures)	1 bar - 10 <sup>-6</sup> mbar	10 <sup>-3</sup> - 10 <sup>-6</sup> mbar	10 <sup>-3</sup> - 10 <sup>-11</sup> mbar
Applications (main classifications)	<ul style="list-style-type: none"> <li>▪ Rough vacuum</li> <li>▪ Process vacuum</li> <li>▪ Industrial vacuum</li> </ul>	<ul style="list-style-type: none"> <li>▪ Semiconductor process vacuum</li> <li>▪ TFT-LCD display</li> <li>▪ Solar</li> <li>▪ LED</li> </ul>	<ul style="list-style-type: none"> <li>▪ Thin film</li> <li>▪ Instruments</li> <li>▪ R&amp;D</li> </ul>
Brand used	Leybold Edwards Atlas Copco Quincy	Edwards CSK	Edwards Leybold Gamma

# VACUUM TECHNIQUE

ROCE  
16%

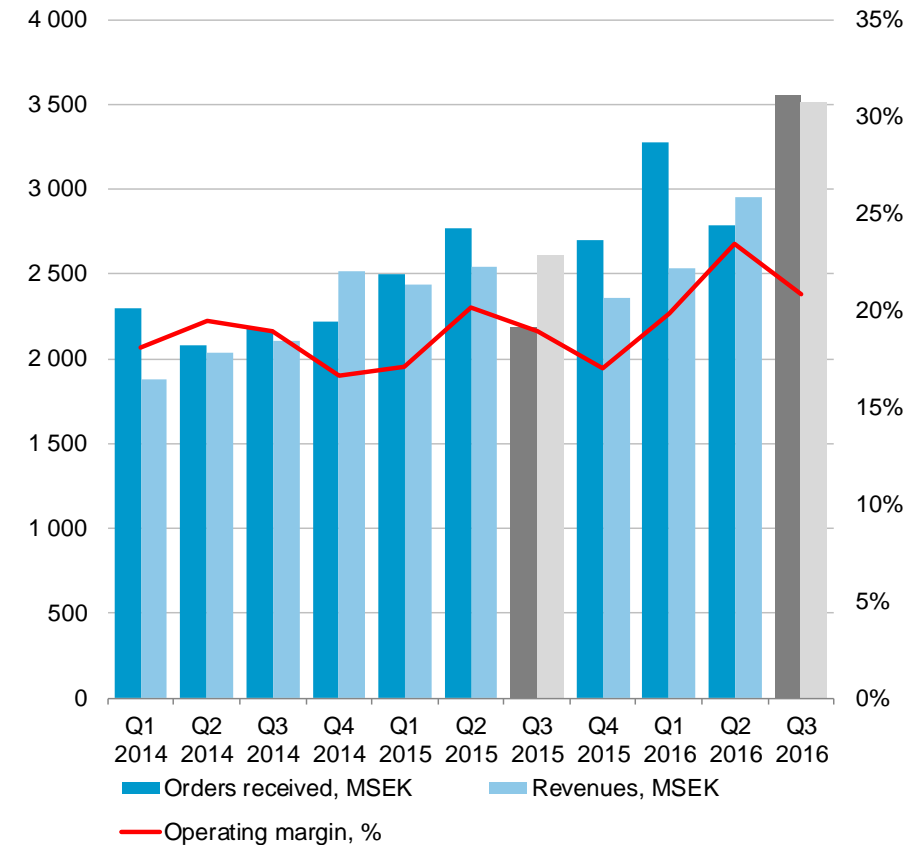
## In Brief

- Vision is to become global market leader in vacuum solutions

## 2016 development

- Organic order growth of 22% Jan. – Sept.
  - Strong order intake from the semiconductor industry, particularly in Asia
- Acquisitions of CSK and Leybold in Q3
- Operating margin at 21.4% (18.7)
  - Support from volume growth and currency
  - Dilution from acquisitions

## Orders, revenues and operating margin\*

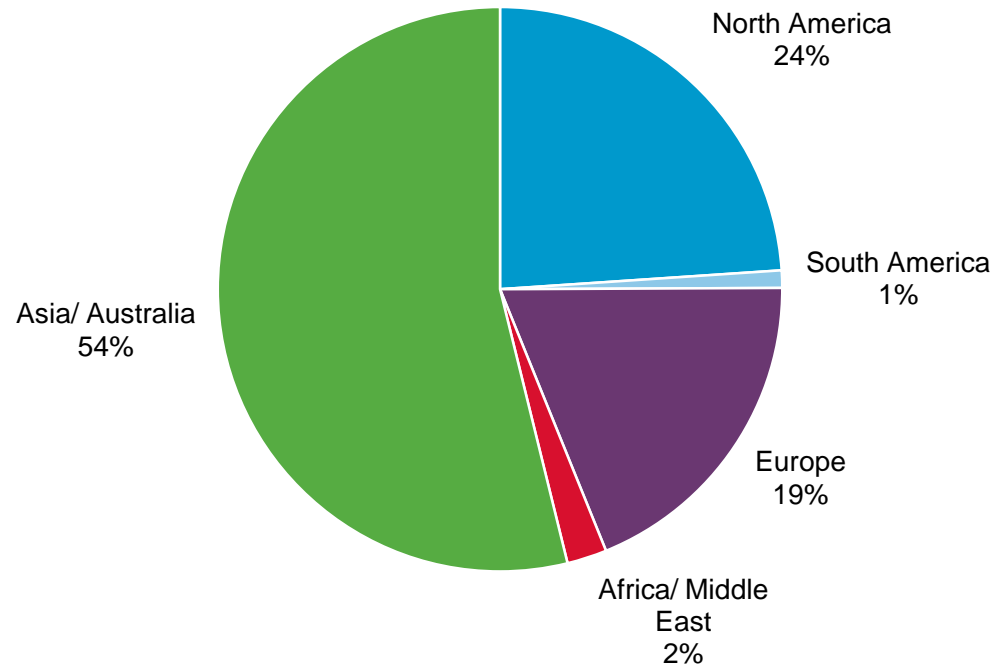


\*Restated figures

# VACUUM TECHNIQUE

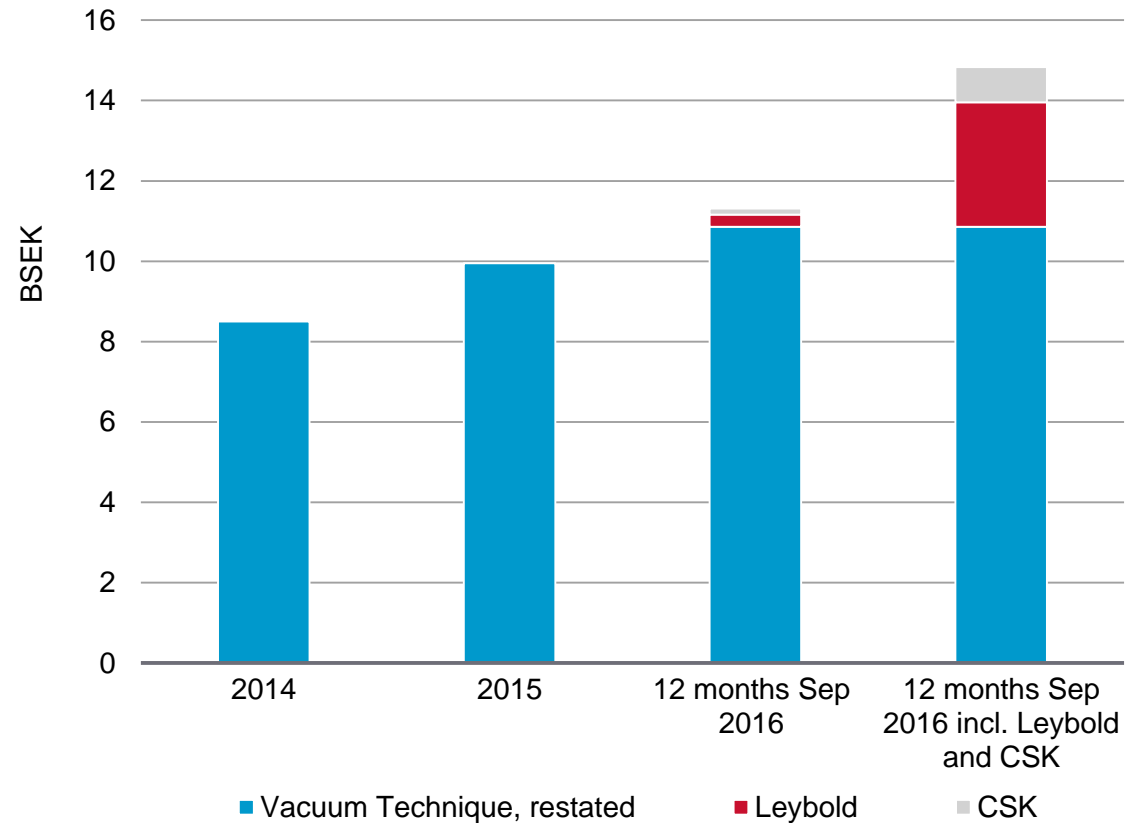
## Including Leybold and CSK

Revenues by region



Revenues by region including Leybold and CSK (when acquired)

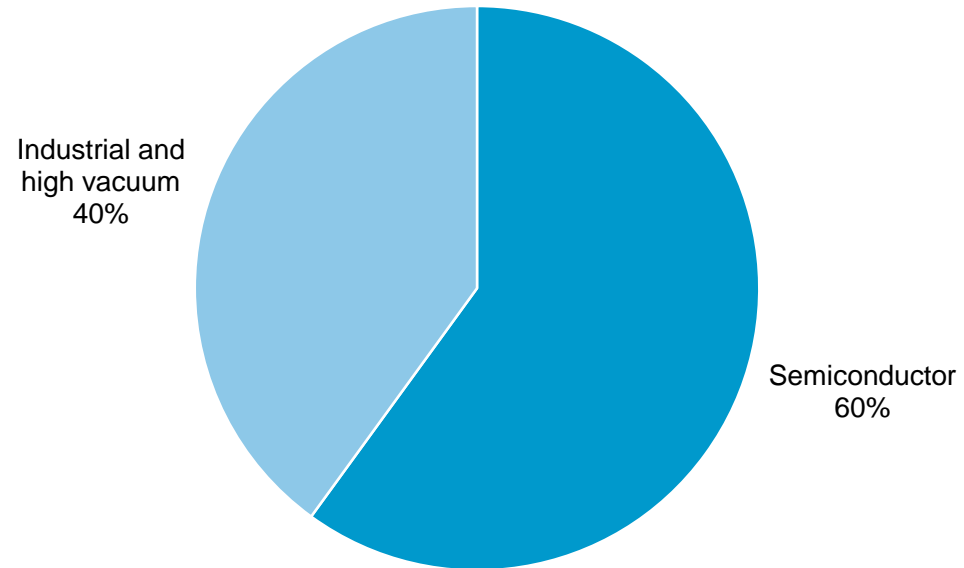
Revenues



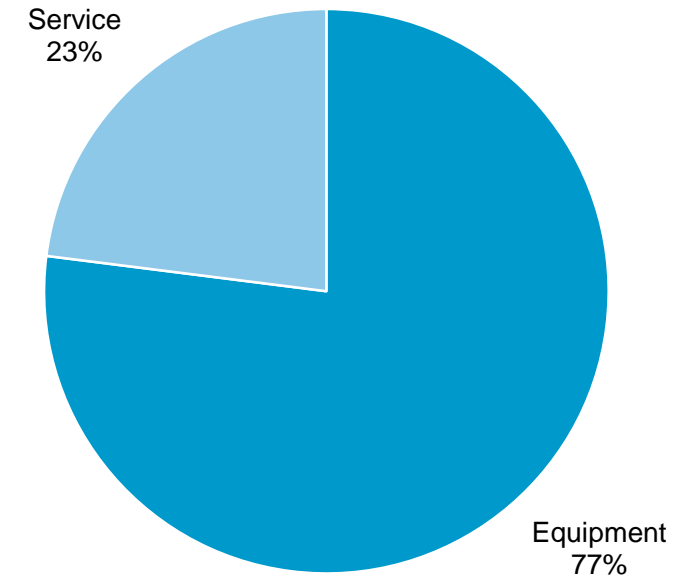
# VACUUM TECHNIQUE

## Including Leybold and CSK

*Revenues by application*



*Revenues by type*

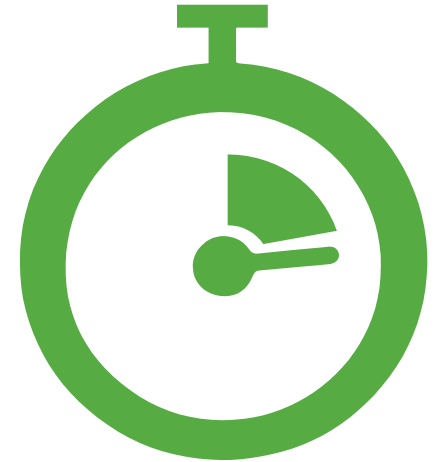


Approximate revenue split including Leybold and CSK (when acquired)

# *VACUUM TECHNIQUE - WAY FORWARD*

# VACUUM TECHNIQUE – FOCUS AREAS

- Successful integration of acquisitions
- Successful implementation of decentralized organizational structure
  - Improve transparency, responsibility, accountability and profitability
  - Increase customer intimacy
- Improve agility and resilience
  - Reduce working capital and supply chain complexity
  - Optimize the utilization of the manufacturing foot print
  - Increase service value offering, penetration and 1-to-1 ratio
- Leverage synergies with other business areas and the Group
- Innovation
  - Accelerate time to market



# VACUUM SOLUTIONS FOR THE SEMICONDUCTOR INDUSTRY

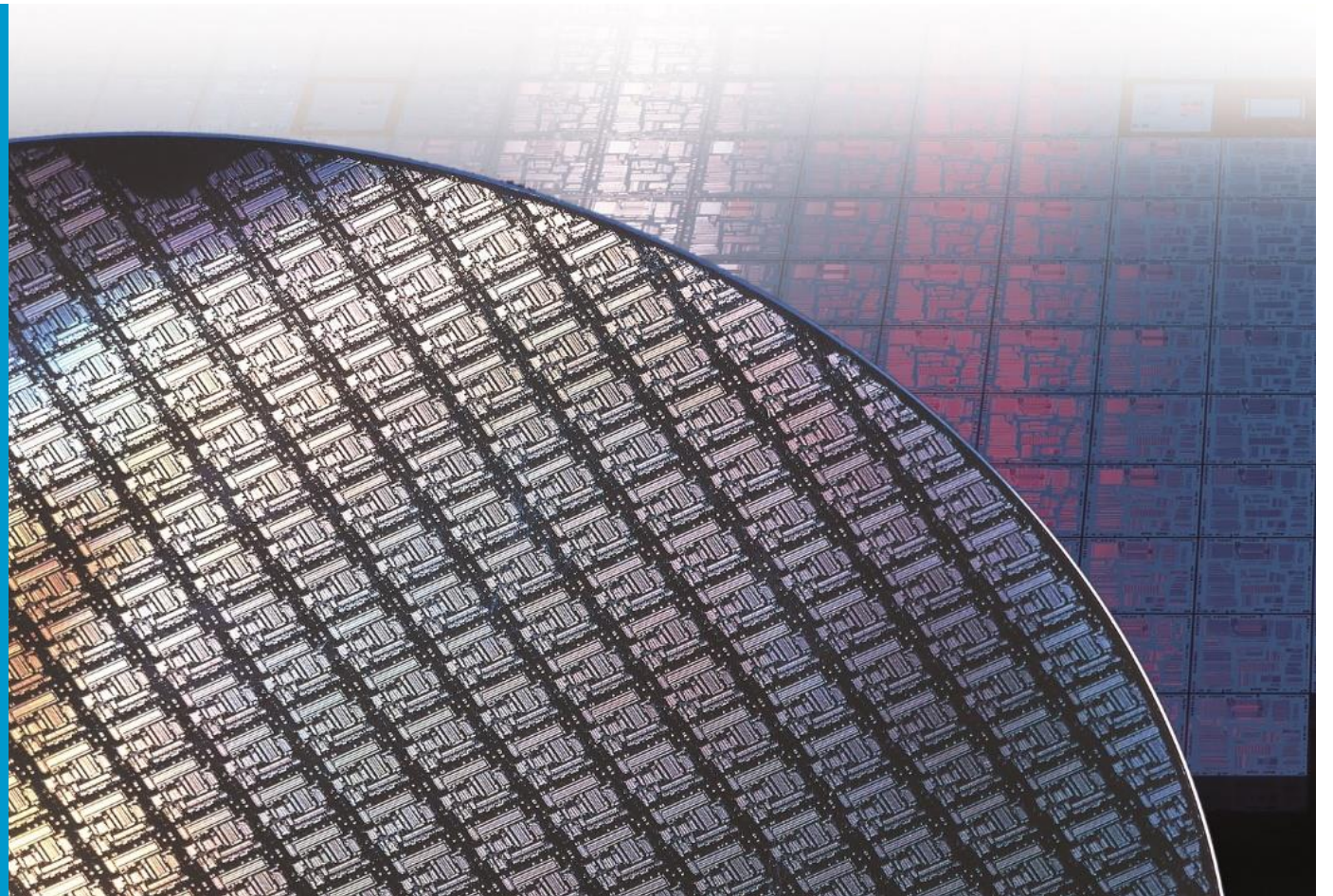
**Mike Allison**

Edwards brand

High customer concentration

A wide technology portfolio

Leadership in integrated systems





# SEMICONDUCTOR INDUSTRY DRIVERS

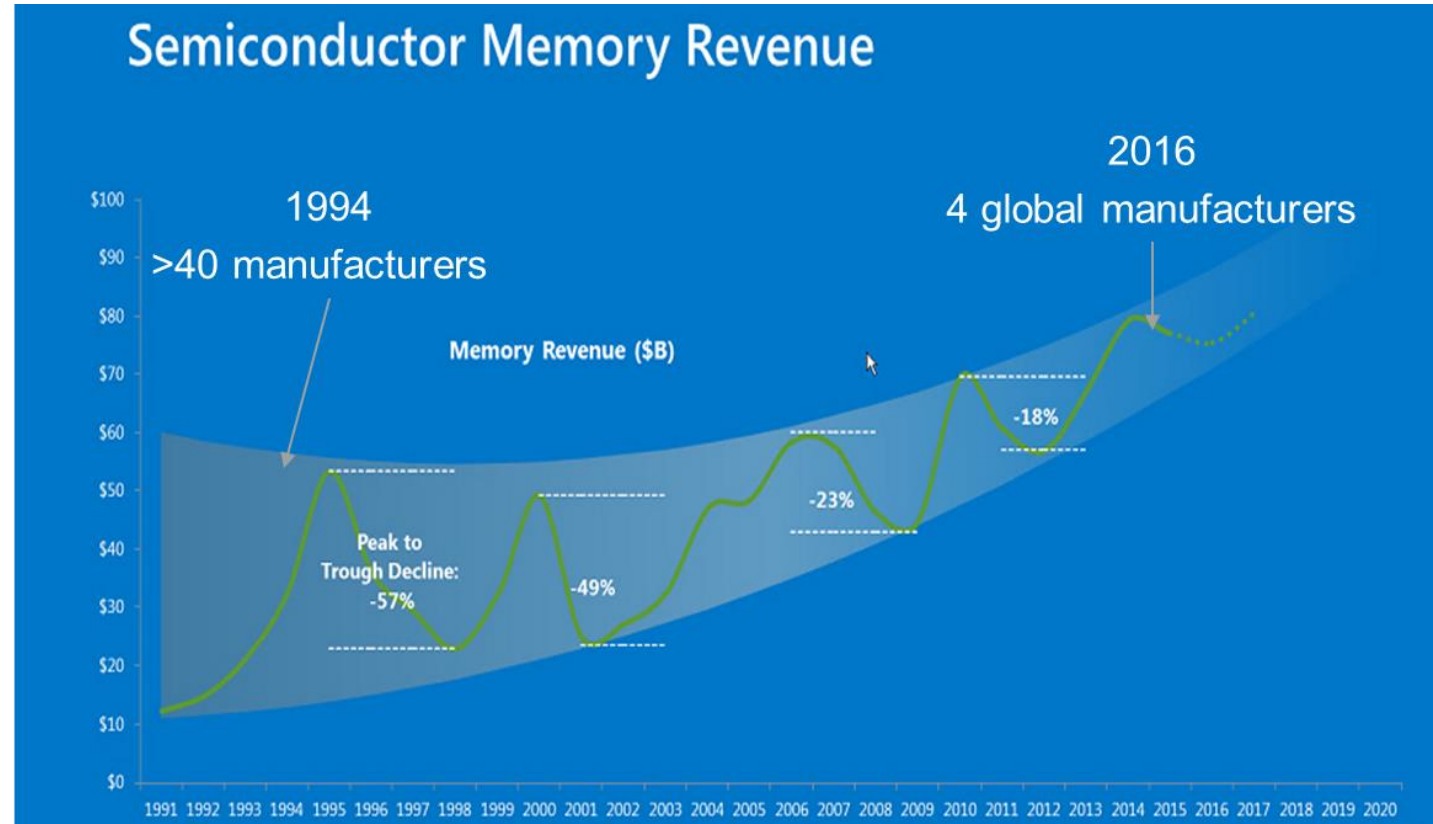
Electronics demand continues into the future



- Moore's law
- Current drivers
  - Smart phones, Tablets, PC's
  - Data storage
  - Internet of Things
  - Automotive
  - Industrial automation

# MEMORY – CONSOLIDATION IS DRIVING STABILITY

- Global strong, profitable and consumer driven manufacturers
- Equipment lead times are getting shorter
  - Smaller incremental investments based on consumer demand (e.g. phone cycles, economic events, etc.)



Source: Micron and Industry Analysts

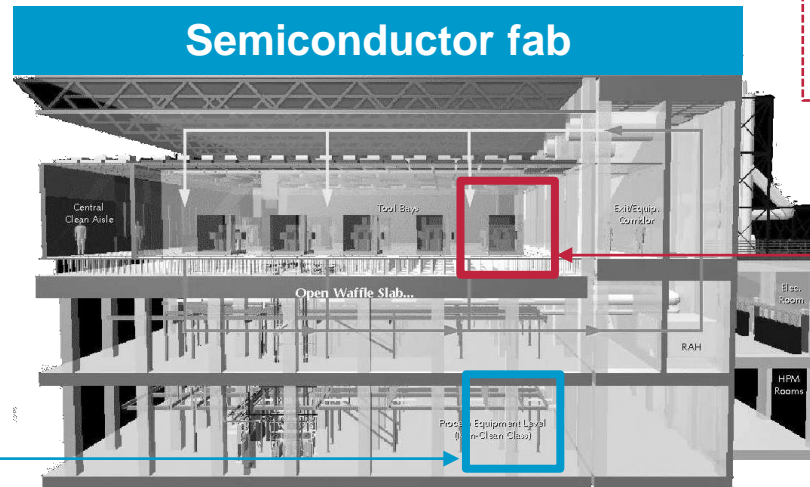
# SEMICONDUCTOR FAB DETAILS

## Examples of what is inside a fab

Vacuum pumps

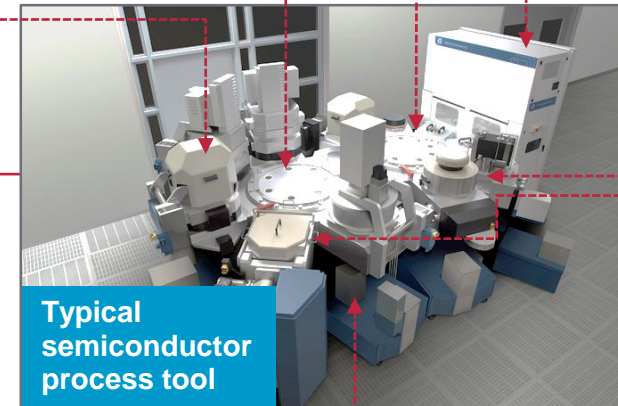


Sub Fab



Power supplies

Robotics (inside) Loader



Chambers

Turbo molecular pump / Cryo (if fitted)

...and lots of other components...

**40 000 wafer starts per month (wspm) requires about:**

- 1 500 vacuum process tools
- 1 000 abatement units
- 2 000 pumps

# CORE TECHNOLOGY PORTFOLIO

Creating an interconnected solution for the sub fab

## Extensive Vacuum technology portfolio

Turbo-molecular pumps (TMP)



Roots Claw Dry Pump

Dry Screw



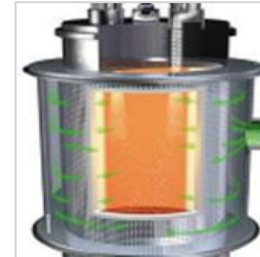
All roots dry pump



Booster



## Broad range of abatement technologies



Fuel Abatement



Plasma Abatement

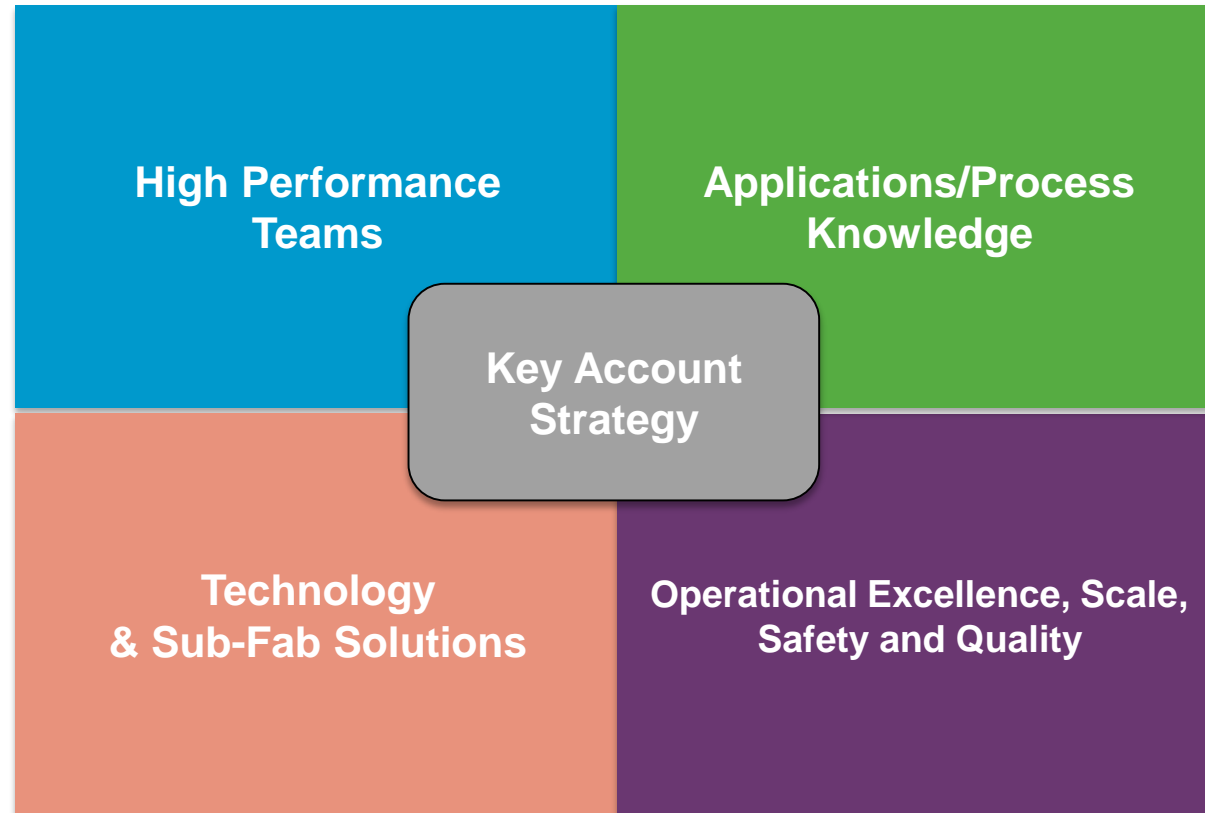
## Field proven integrated solutions



eZenith  
Integrated System

# OUR STRATEGIC FOCUS

Undisputed leader in vacuum and exhaust gas management solutions



# THE FUTURE

## Vacuum solutions for the semiconductor industry

### *Opportunities – growth drivers*

- Consolidation is driving stability
- New technologies
  - NAND (non-volatile, flash memory) / 3D NAND
  - Extreme Ultra Violet (EUV) lithography
  - OLED growth
- Integrated systems
- Demand growth
  - PC's, tablets, smartphones
  - China - \$100B investment fund
  - Service penetration

### *Challenges*

- Price pressure
- Master new technologies
- Cost efficient manufacturing

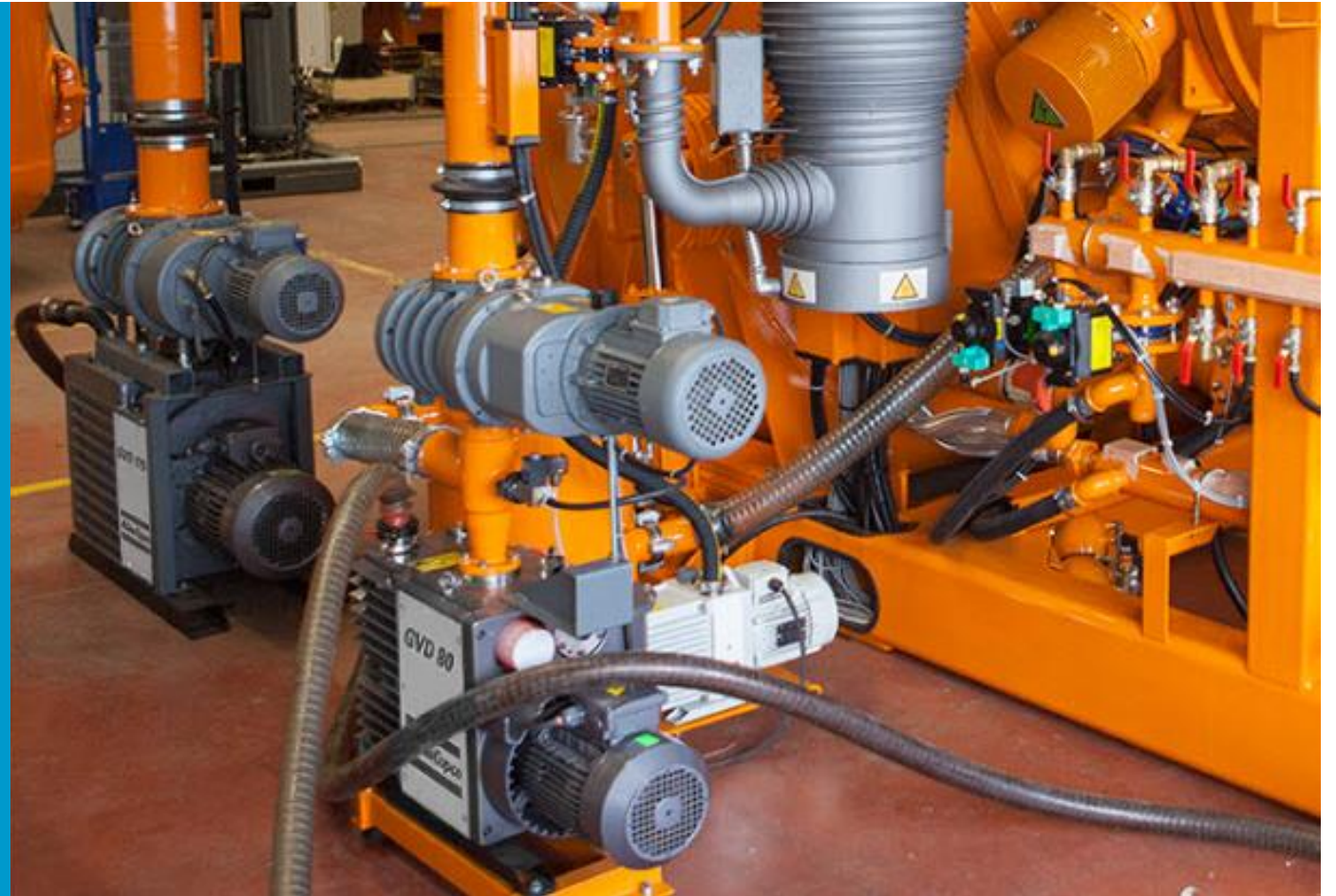
# VACUUM SOLUTIONS FOR THE GENERAL INDUSTRY

Koen Lauwers

Leybold, Edwards and Atlas Copco brands

Growth strategy

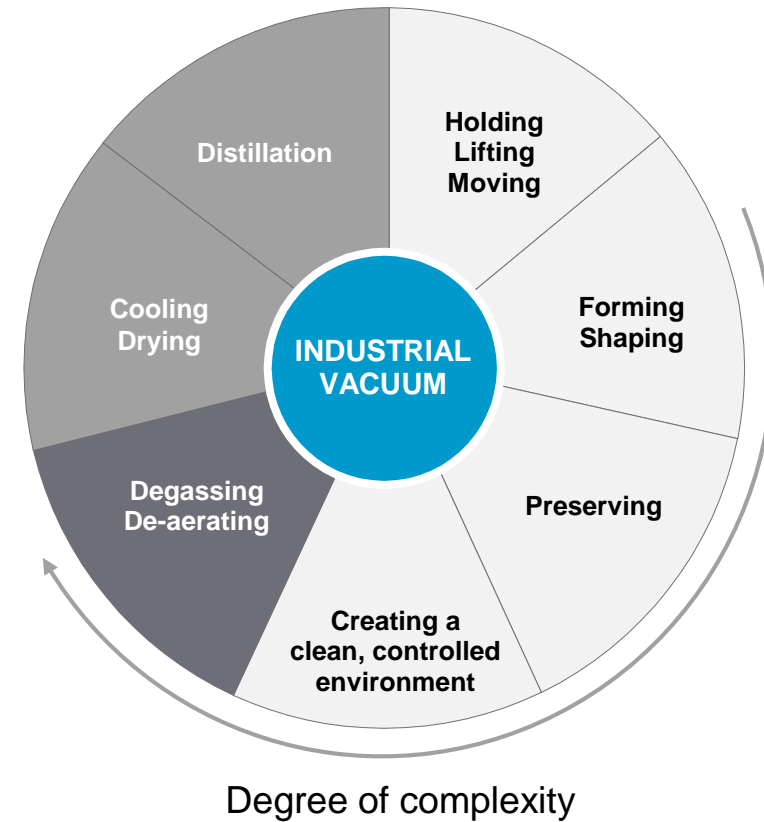
Product innovation focus



# MARKETS FOR INDUSTRIAL VACUUM

- Strive for growth
  - Densify presence
  - Innovation
  - Brand management

## 7 Main applications for industrial vacuum use



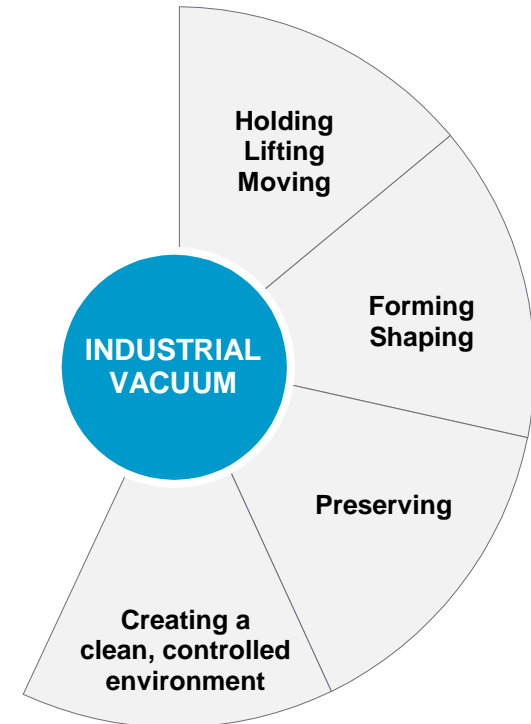


# MARKETS FOR INDUSTRIAL VACUUM

- Rough (utility) vacuum
  - Direct, indirect and OEM channels
  - Strong innovation program



Disruptive screw and claw technologies launched in 2015 and 2016



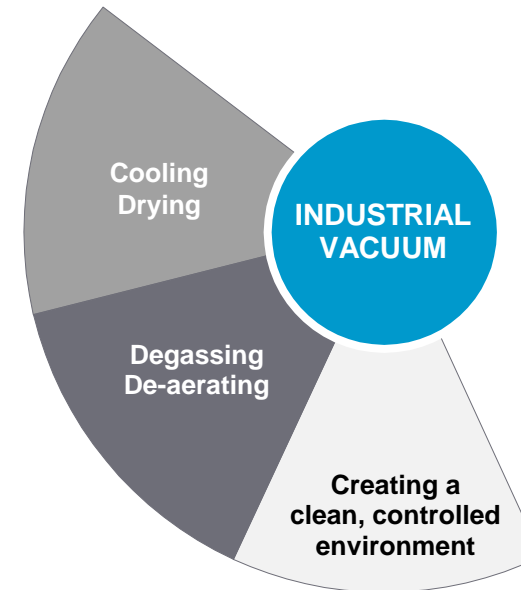
General industry, packaging, canning, food, electronics, etc.

# MARKETS FOR INDUSTRIAL VACUUM

- Industrial vacuum
  - Harsh applications - competence prerequisite
  - Edwards and Leybold brands well positioned
  - OEM and end customers



Successful penetration in the lithium ion battery markets



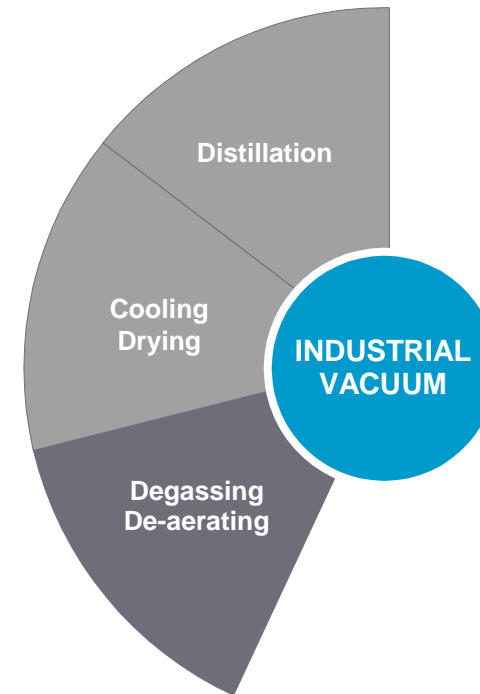
Metallurgy, automotive, electricity, light bulbs, etc.

# MARKETS FOR INDUSTRIAL VACUUM

- Process vacuum
  - Harsh applications
  - End customers and Engineering, procurement and construction companies (EPC'S)
  - Product programs defined



Example of an Edwards liquid ring pump skid for an offshore sea water de-aeration unit



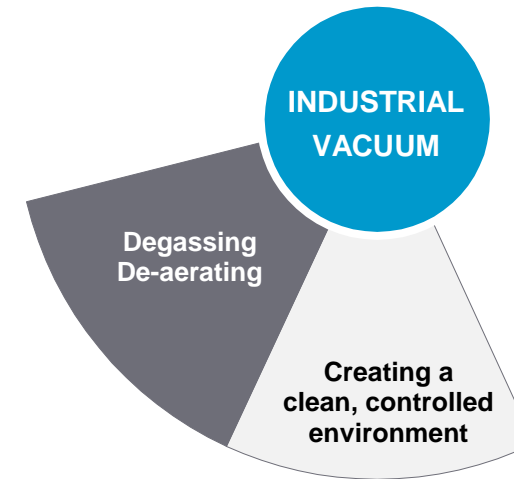
Chemicals, petrochemicals, pharmaceuticals, plastics, food processing, etc.

# MARKETS FOR INDUSTRIAL VACUUM

- Thin film
  - Edwards and Leybold well positioned
  - OEM and end customers



Example of coater system



Optical coating, data storage, glass and surface coating, display coating, solar, etc.

# INNOVATION

## The key to success for Industrial Vacuum

- Traditional focus is on application driven solutions, allowing aging of platforms
- Our focus is on disruptive product platforms!
- Example the GHS VSD+ pump

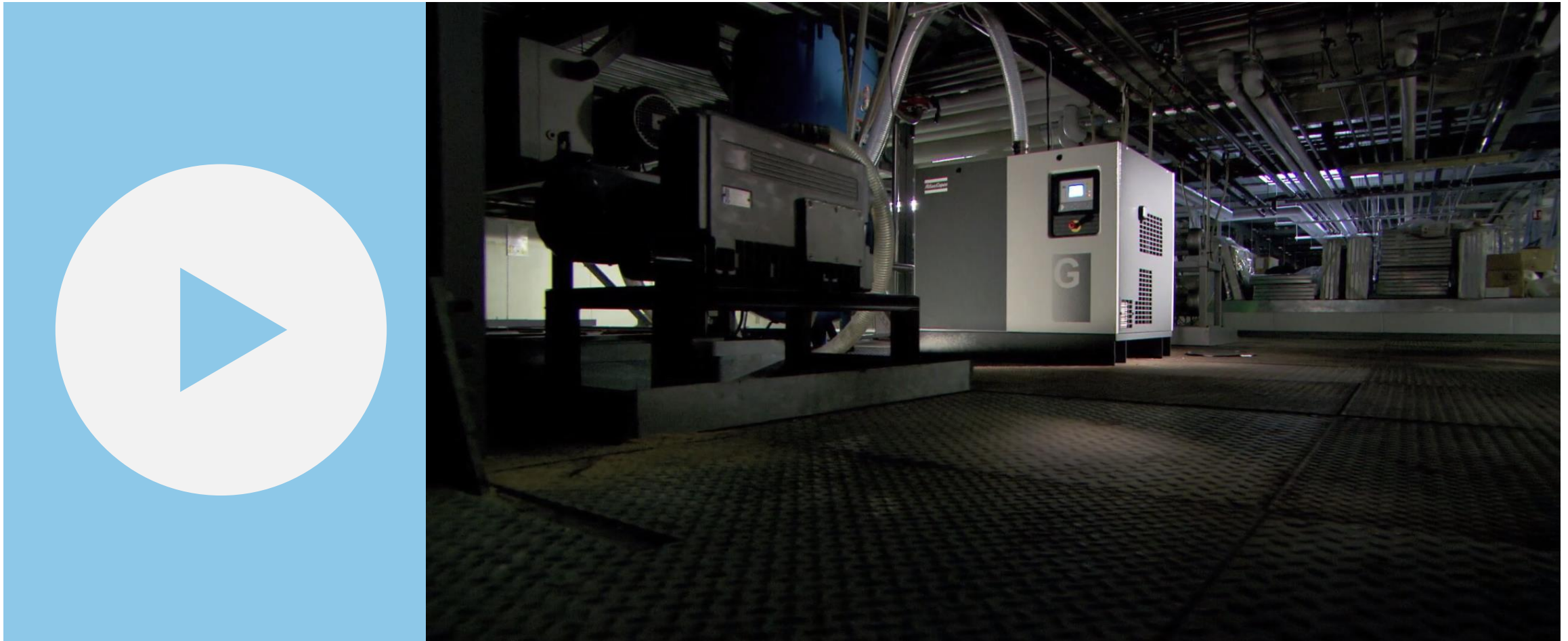


Best in class in efficiency, noise, functionality

75% same components as for the compressor range GA VSD+

# INNOVATION

## CHS VSD+ Vacuum pump



# ***THE FUTURE***

## **Vacuum solutions for the general industry**

### *Opportunities*

- Organic growth
- Leverage branding
- Expand the offer with disruptive innovation
- Strive for manufacturing excellence
- New applications in emerging markets and technologies
- Grow the service business

### *Challenges*

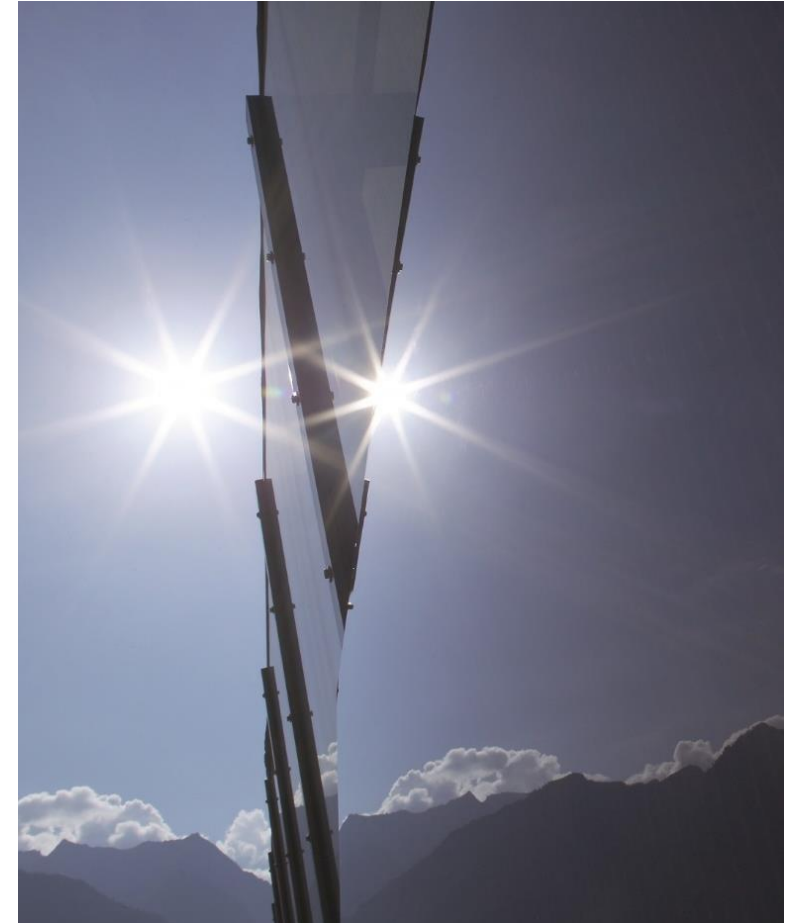
- Slow growth in traditional applications
- Competitive market conditions

# ***SUSTAINABLE VACUUM SOLUTIONS***

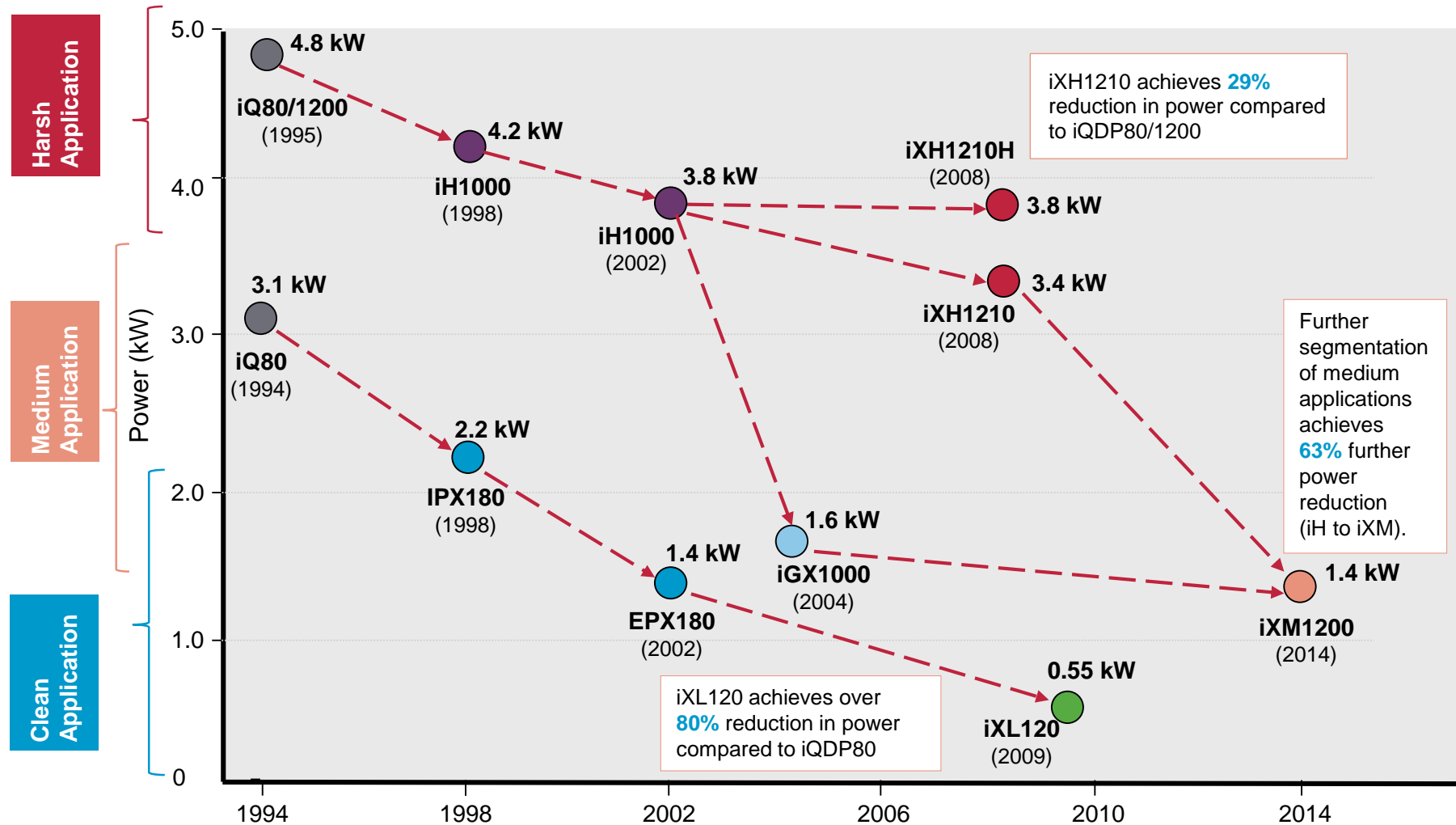


# ENABLING ENVIRONMENTAL TECHNOLOGY

- Solid state lighting, e.g. LED, can offer 80% energy savings
- Solar cells provide clean renewable energy
- Biofuel production uses vacuum in the process
- Vacuum used in the production of steel alloys can reduce the level of hydrogen, carbon and other impurities during the process
- Did you know?
  - Over 50% of the world's solar panels made are using Edwards products



# EDWARDS' POWER REDUCTION TREND



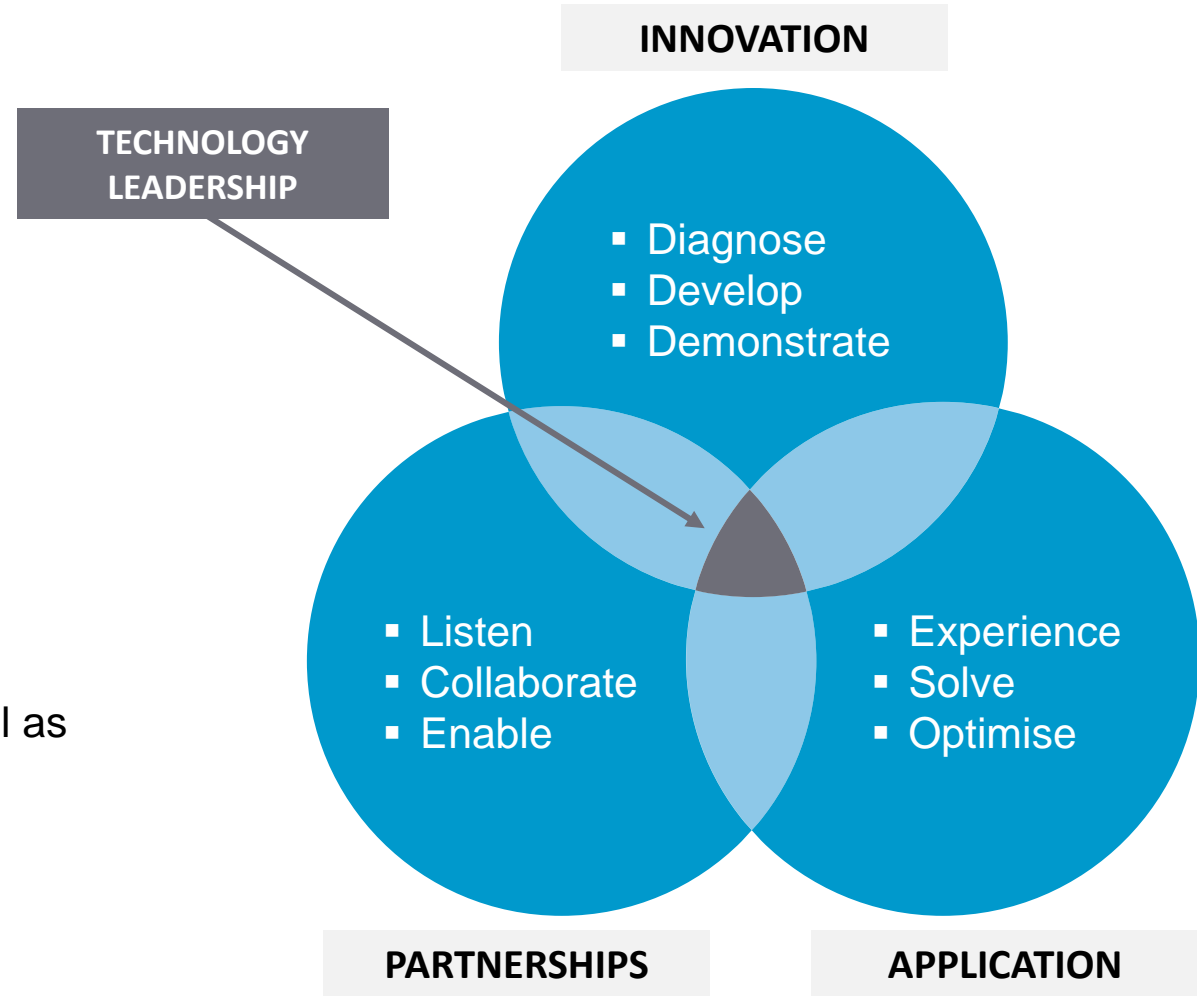
# INNOVATION DRIVERS AND SUCCESS FACTORS

## ■ Innovation drivers

- Total cost of ownership
- Environmental challenges
- Noise & footprint
- Technology changes

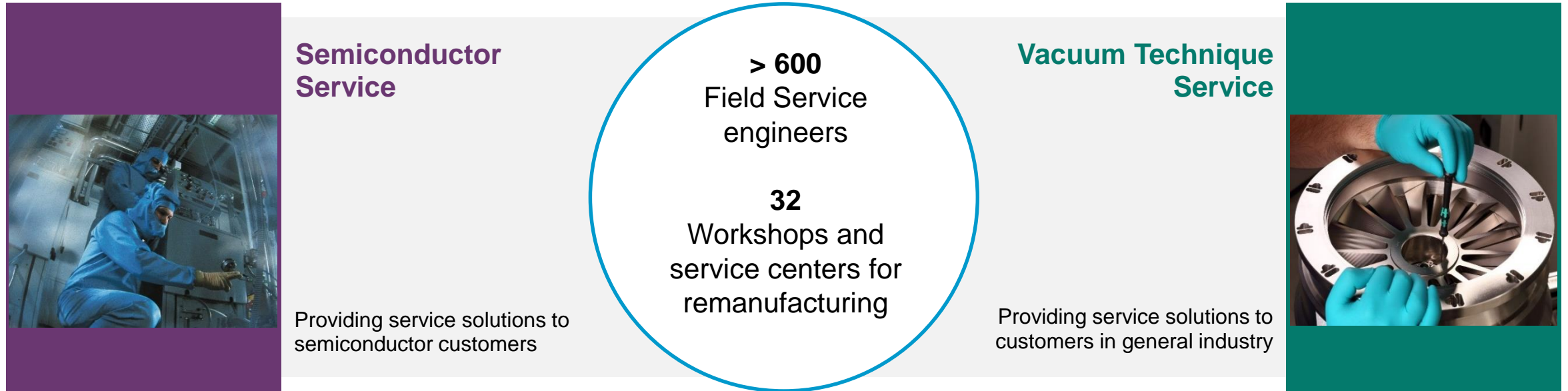
## ■ Success factors

- Long-term collaboration with customers
- Proven results – for customers across all core industries
- Partnerships with demanding customers as well as with industry and academic groups



# ***SERVICE OFFER***

# TWO SERVICE BUSINESSES



**Remanufacturing**



**Parts**

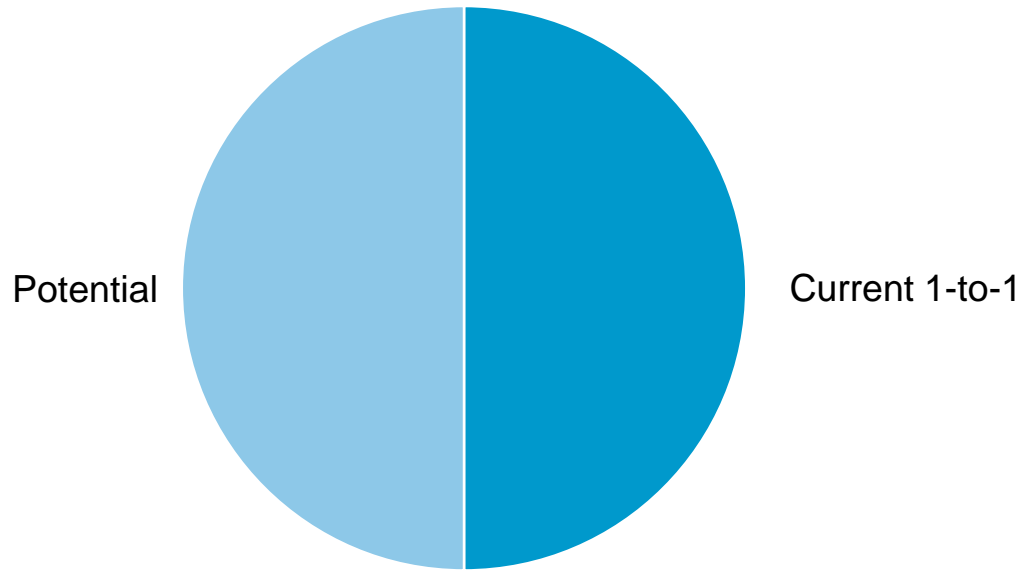


**Labour**

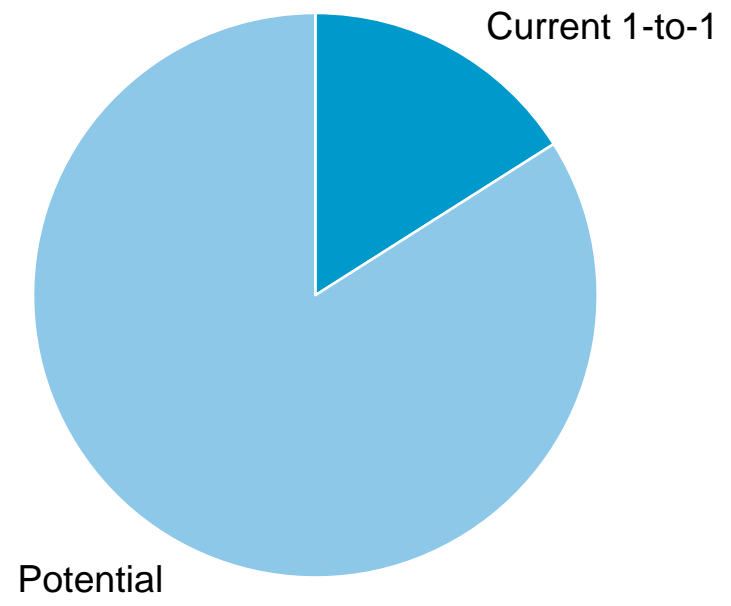
# SERVICE

## 1-1 Ratio

*Semiconductor*



*General Vacuum*



# CONNECTIVITY

- EdCentra
  - Edwards' latest equipment monitoring and data analytics platform
  - Deployed on a server inside a customer's facility
  - Supporting several hundred devices per instance
  
- FabWorks (Legacy product)
  - Total connected devices: ~ 75 000



# SUMMARY

## Vacuum technique

Vacuum is a growth area

Vision is to become and remain the global leader in vacuum solutions

Focus on integration

Innovation





***COMMITTED TO  
SUSTAINABLE PRODUCTIVITY.***



*Atlas Copco*



# CAUTIONARY STATEMENT

“Some statements herein are forward-looking and the actual outcome could be materially different. In addition to the factors explicitly commented upon, the actual outcome could be materially and adversely affected by other factors such as the effect of economic conditions, exchange-rate and interest-rate movements, political risks, the impact of competing products and their pricing, product development, commercialization and technological difficulties, supply disturbances, and major customer credit losses.”