

# A global update on the market for motor-driven systems

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Presented by:

Preston Reine

Research Manager, IHS Markit

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IHS Markit™

# Agenda

- Economic update
- Motor and drive market factors
- Motor-driven equipment trends and statistics
- Emerging technologies
- Conclusion

# Industrial Automation research areas

## DISCRETE & PROCESS AUTOMATION

Controllers  
Industrial  
Communications  
Process Instrumentation  
Visualization  
Smart Manufacturing

## ELECTRIC MOTOR SYSTEMS

Drives  
Mechanical Power  
Transmission  
Motors

## CAPTIAL EQUIPMENT & MACHINERY

3D Printing  
Generators  
Machinery  
Motor Driven Equipment  
Switchgear  
Turbines

# Economic update on the industrial automation market



# Global economic growth has been revised upward

- Global growth will pick up from 2.5% in 2016 to 3.0% in 2017 and 3.2% in 2018, led by the United States and emerging markets.
- The US economy will benefit from sustained growth in consumer spending, renewed growth in capital spending, and an improving tax and regulatory climate.
- Eurozone growth will be steady, but United Kingdom growth is expected to slow through 2018 as Brexit-related uncertainty delays investment.
- After a good start to 2017, China's economic growth will slow because of persistent imbalances in credit, housing, and industrial markets.
- Russia and Brazil are beginning slow recoveries.

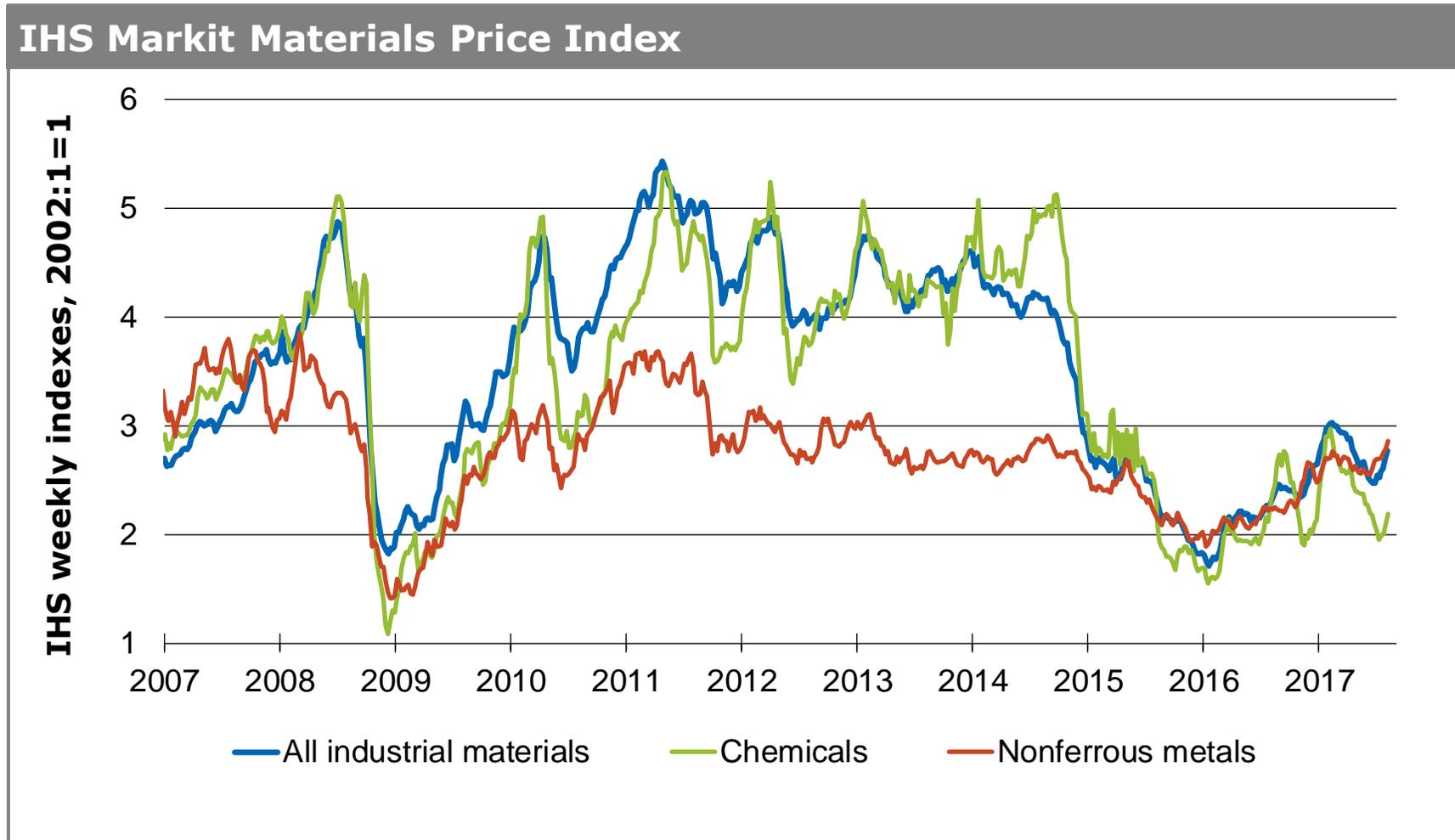
# Business and market conditions

- Commodity markets: industrial raw materials surging
  - Not sustainable
- Monetary policy: normalization on track; banks in no hurry
  - Overall growth improving; inflation slow
- US dollar weakening as politics and economics diverge; opposite in Eurozone
- Global investor confidence increased in 3<sup>rd</sup> Quarter, boosting overall employment
- 2018 will have more variable commodity prices

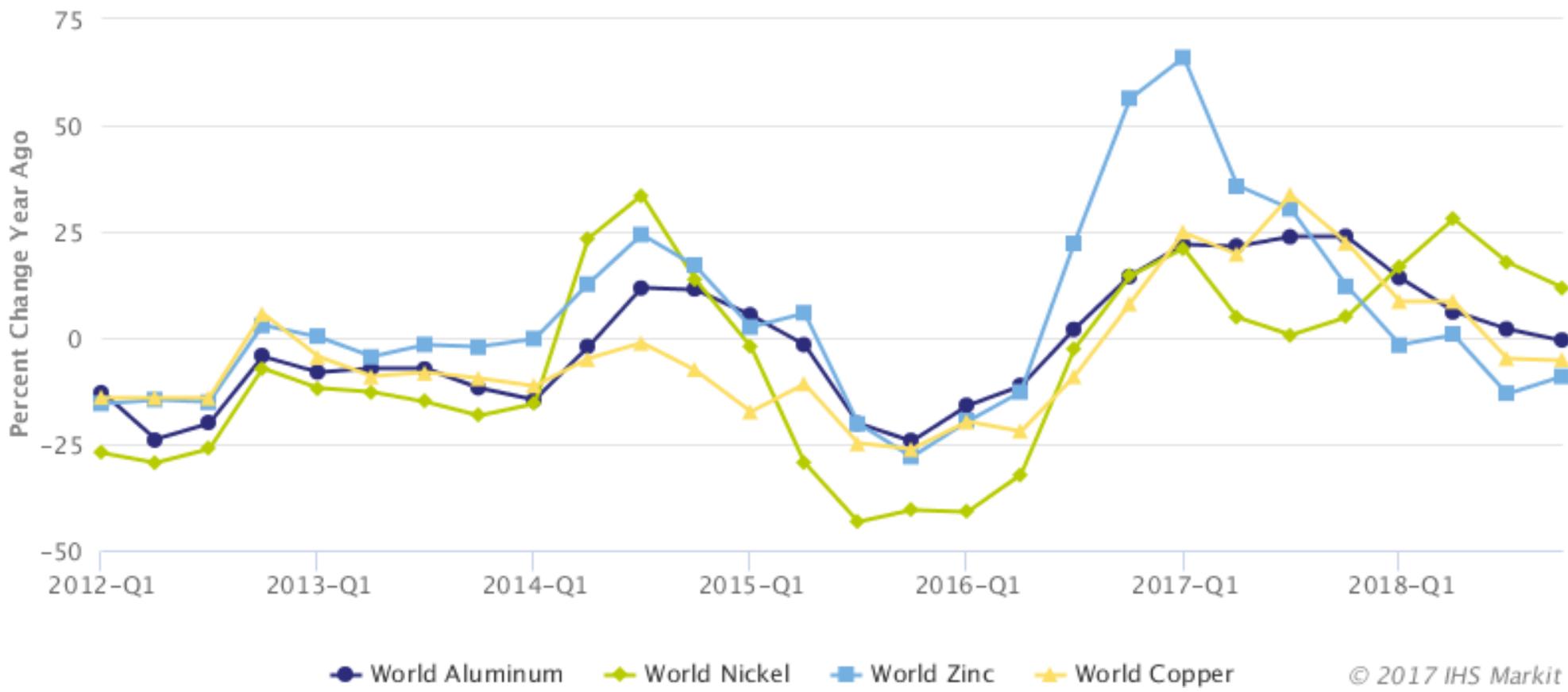
# World trade volume and industrial production are accelerating markedly in 2017



Industrial materials prices are recovering but remain well below their previous peaks



# Nonferrous metals overview: are markets exposed?



Motor and drive suppliers unable to pass on costs to customers –  
Prices have remained depressed, especially in competitive applications

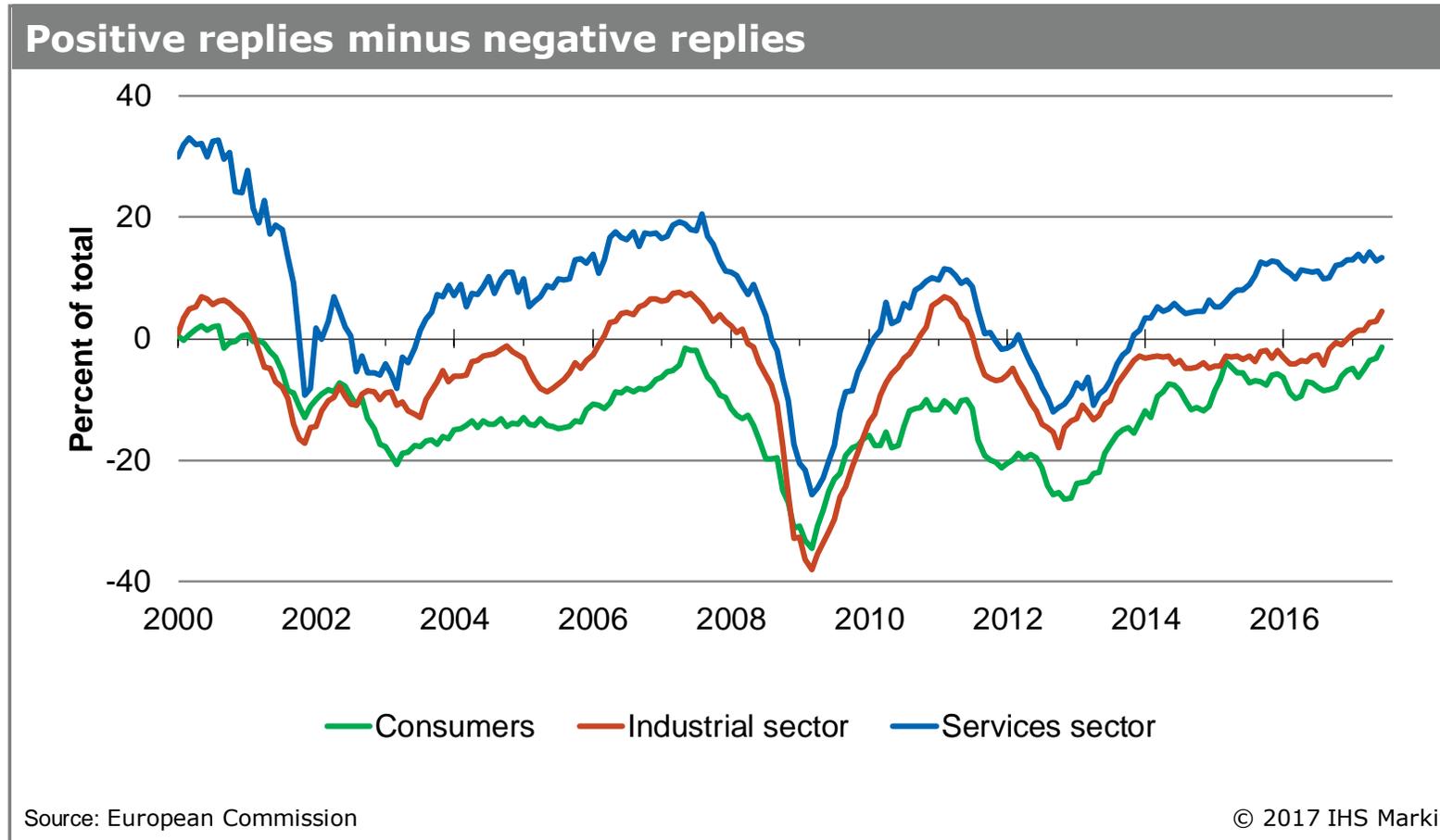
# Commodity price impact on industrial automation equipment

- **Petroleum products** – oversupply and reemerged supply surplus hurts investment opportunities for motor/drive/end-equipment
- **Natural gas** – production climbs limit prices. Continued low feedstock costs are good for downstream applications
- **Steel** – prices can still go down due to overproduction in China.
- **Nonferrous metals** – prices recently rising. Likely due for market correction downward in early 2018

## Commodity price impact on industrial automation equipment (continued)

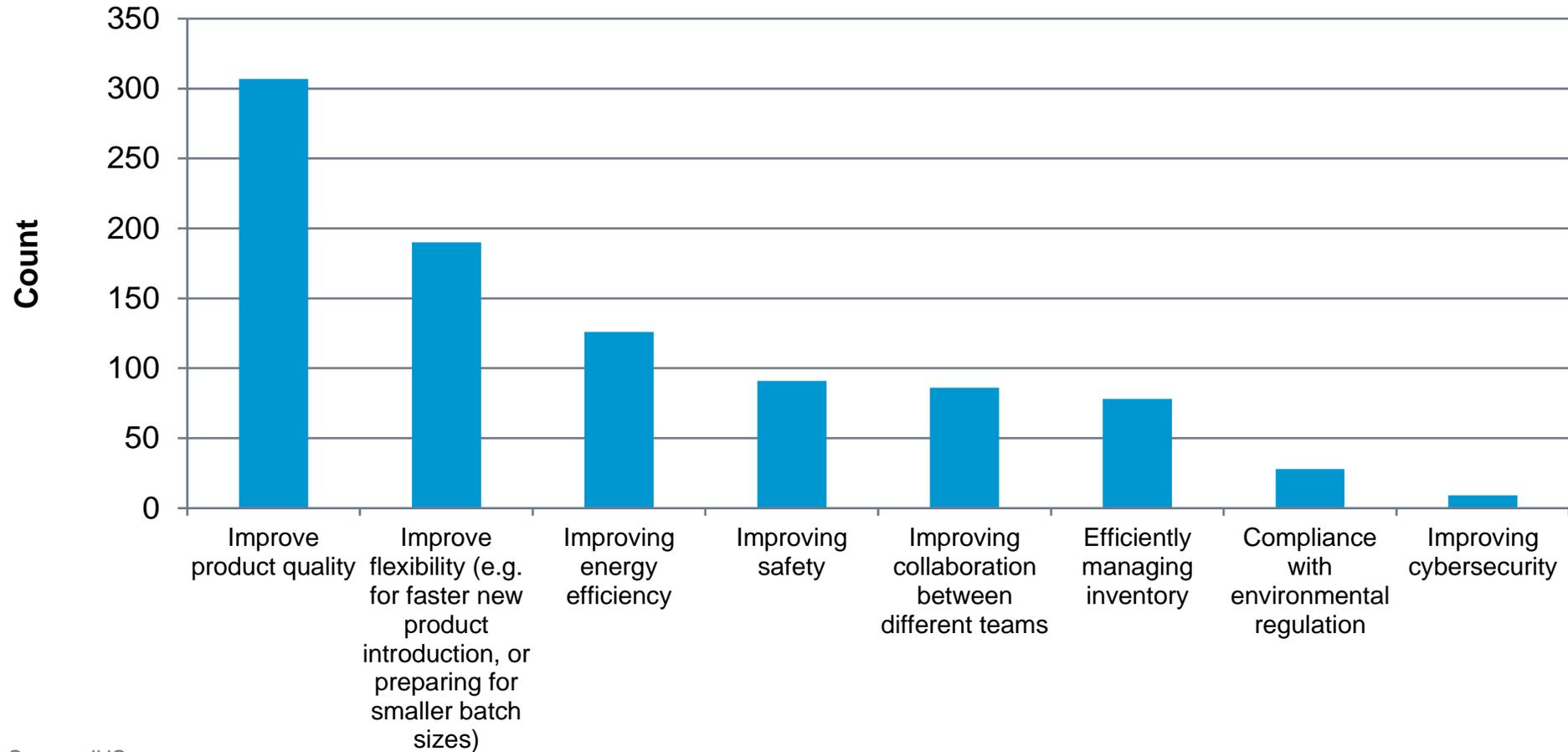
- **Electronic components** – prices staying put, but increased demand in automotive, industrial, and healthcare
- **Electrical machinery and equipment** – softness in input prices remains. Oversupply and price competition
- **Nonelectrical machinery and equipment** – some near term price increases, but sluggish performance in heavy industries provide no upward pricing pressure. Global manufacturing remains lackluster

# Eurozone economic sentiment near its 10-year high



# What do machine users want?

Other than increasing production, what do you think is the main factor driving automation investment within your company?



Source: IHS  
Sample size = 915 Sample frame = all respondents

# Motor and drive market factors



# Overview of industrial low-voltage motor market (million units)

2017 estimated  
unit shipments

**39.8M**

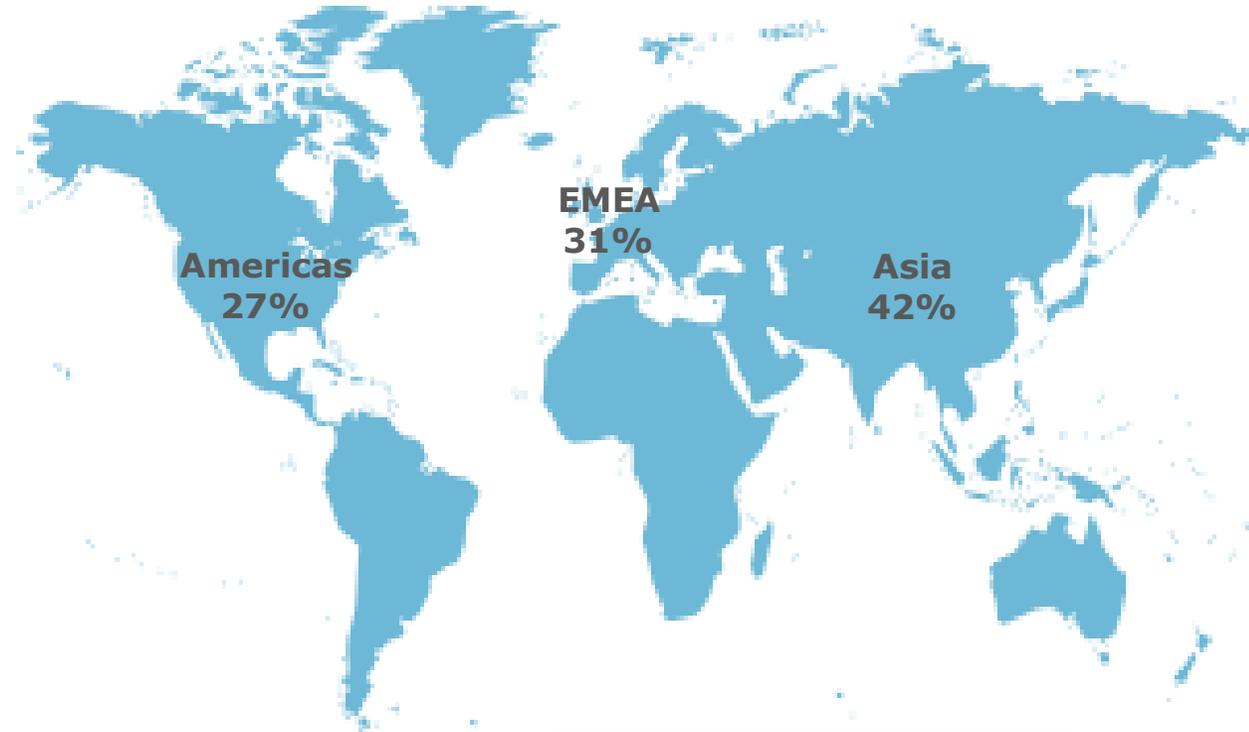
Top-3 Leading  
Suppliers

**ABB**

**Siemens**

**WEG**

World revenue by region (%)



Unit shipment CAGR  
(2016-2021)

Americas  
**0.8%**

Asia  
**3.3%**

EMEA  
**0.0%**

# Electric motors overview

## Leading regional vendors

### Americas

- 1 ABB
- 2 WEG
- 3 Nidec

### Asia Pacific

- 1 Wolong
- 2 Siemens
- 3 ABB

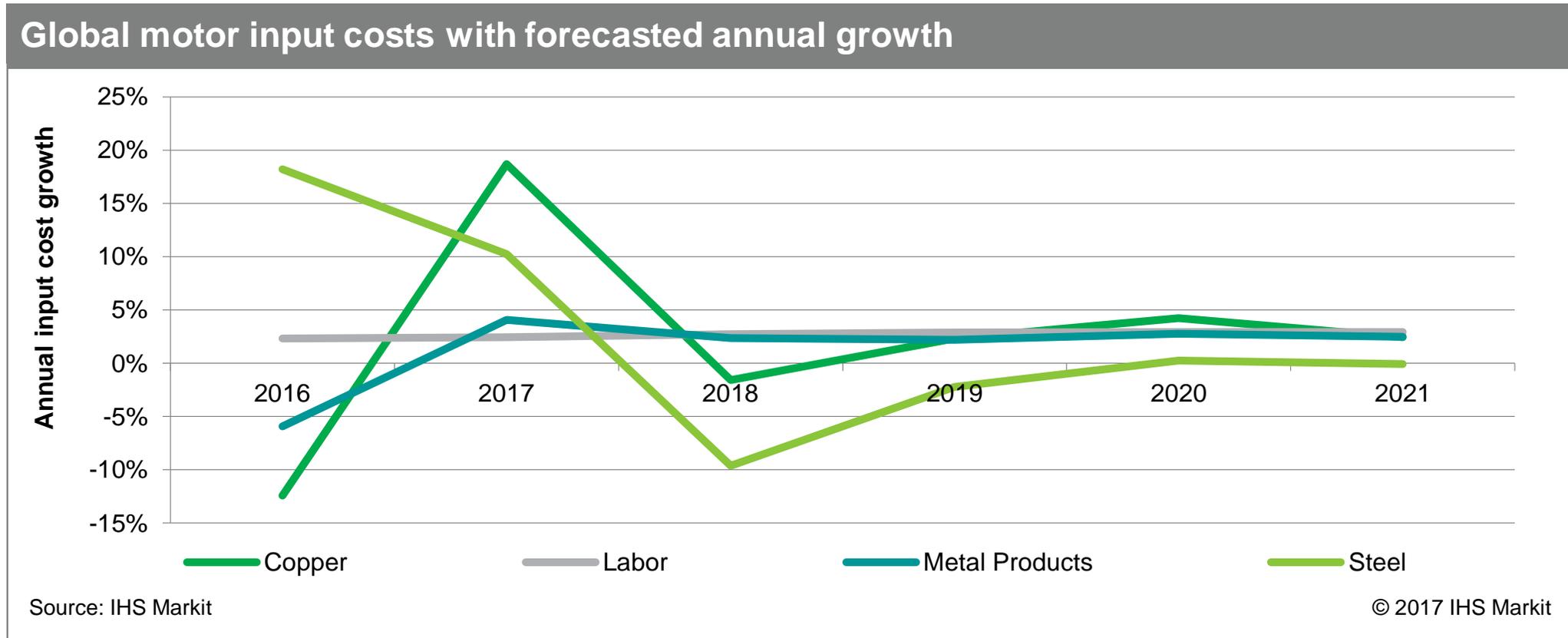
### EMEA

- 1 Siemens
- 2 ABB
- 3 ATB Motors

## Market trends: Average selling prices (ASP) and supply chain are crucial

- More standards and weak profit = manufacturer focus on training, lean manufacturing, Research & Development
- As higher-priced IE3/premium efficiency motors become more prevalent, average sales price (ASP) will increase
- 20% increase in motor price between comparable motors for each efficiency rating
- Increased supply chain costs passed on to customers starting 2018
- Consumers cost-conscious, but leading suppliers offering broader solutions
- Brand recognition is very important still

# Input costs increased in 2017, but not to a sustainable level



# Key trends

## Efficiency Ratings and Regulations

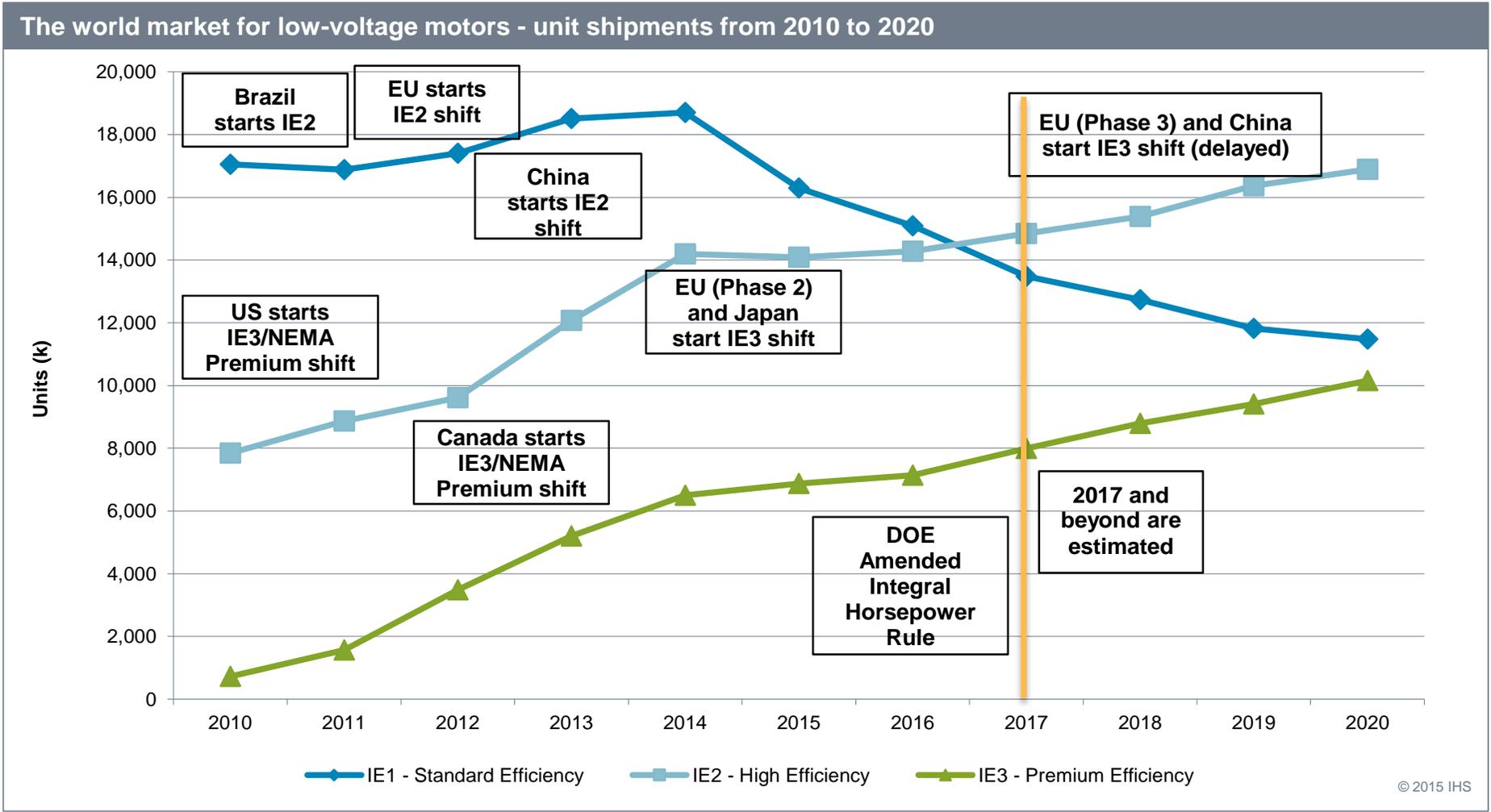
- Over the past decade, motor efficiency regulations have gotten stricter
- Majority of regions still allow IE2/high efficiency motors to be placed on the market
  - These are expected to continue outpacing the average market growth
  - Brushed DC motors and IE1/standard efficiency motors will continue to be phased out by conversions to more-efficient operations.
  - Proposed regulations and scope revisions mandating IE3/premium efficiency motors will not inhibit IE2/high efficiency motor market growth before 2021 on a global basis
  - While the niche market for IE4/super premium efficiency motors is outpacing the rest of the low-voltage motor market, no current or proposed regulations mandate their use → little urgency to adopt

## Technology

### Sensors

- The rudimentary role of motors has largely prevented the development of Industry 4.0
  - Communication functionality and intelligence is typically deferred to motor controls or end equipment.
  - However, suppliers' growing focus on system analytics and optimization has increased the value of any data that can be collected and used for system modelling
  - Aftermarket motor sensors have been developed to monitor temperature, vibration, and other motor behavior that could indicate an impending failure.
  - Built-in sensors appear to be a big motor design of the future

# Global MEPS timeline



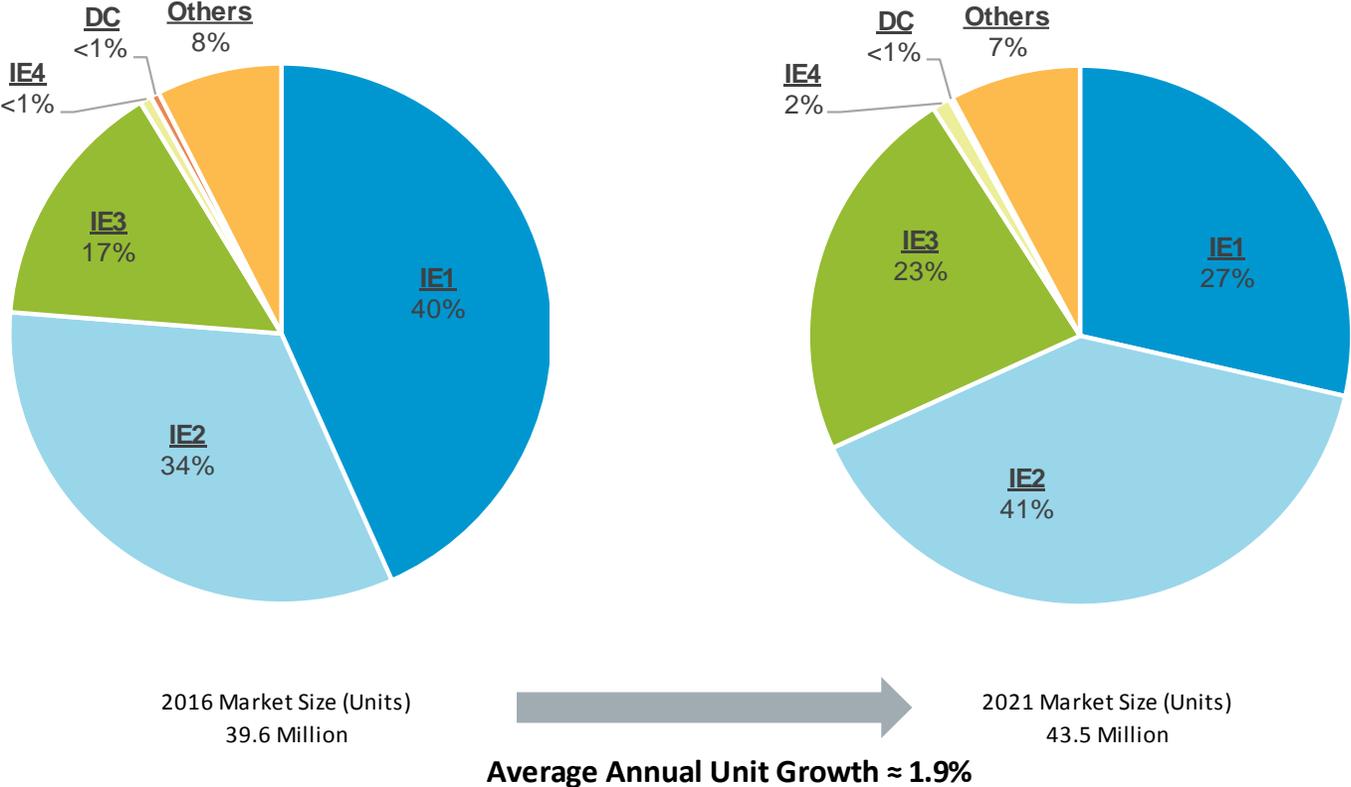
The Low Voltage motor market has been declining or flat since 2014. 2017 sales declined by 2.4%

# Global MEPS development

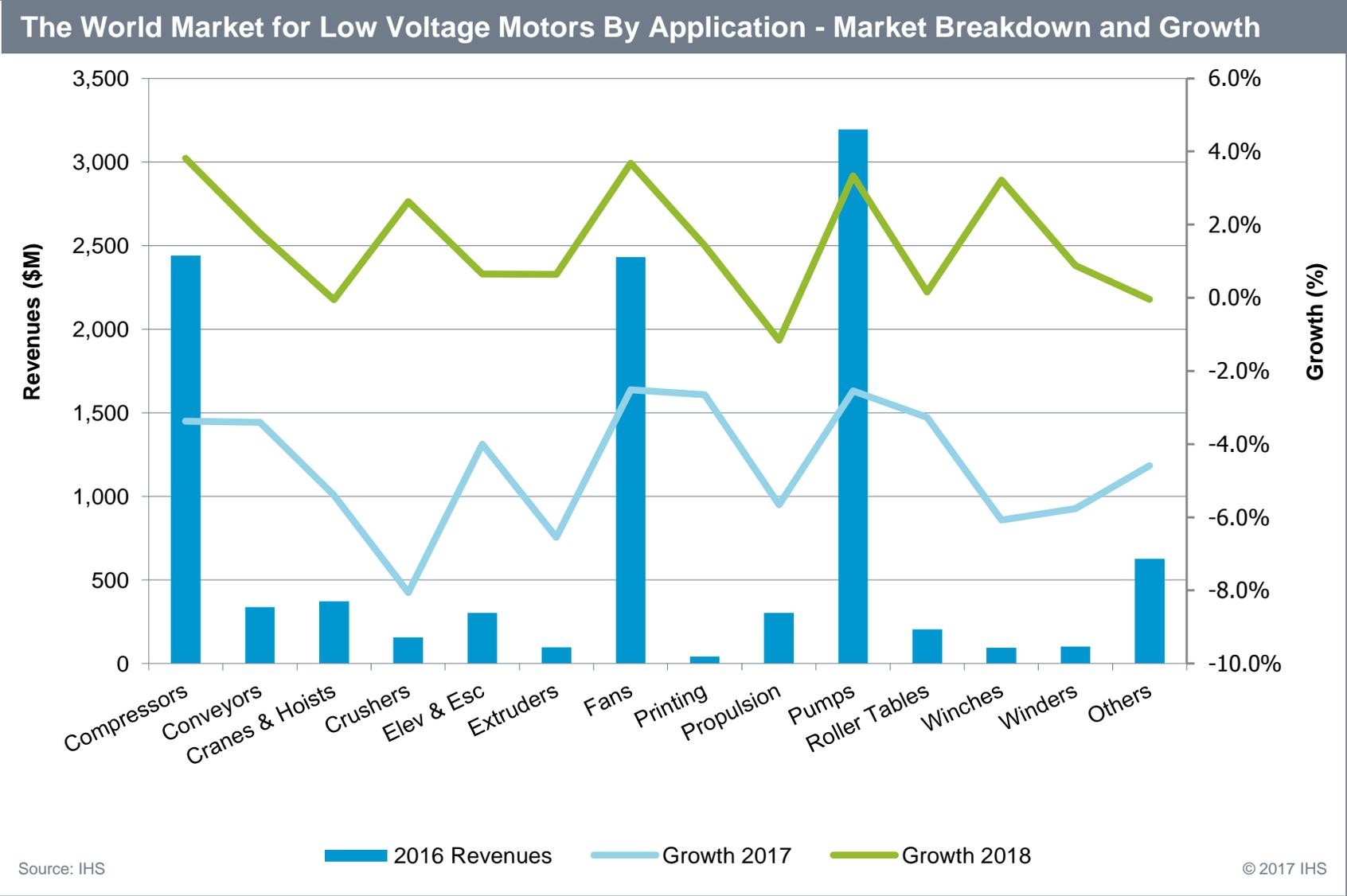
- NEMA Standard/IE1 drastically reduced in shipments from 2014 to 2016 (46% share to 40%), due to increased focus on efficiency in Western Europe, North America, China
- Compliance, emerging technologies are potential headwinds going forward

## EFFICIENCY CLASS TRANSITIONS (UNITS)

Global Low Voltage Motors - Efficiency Class Transition: 2016 to 2021



# Major motor applications



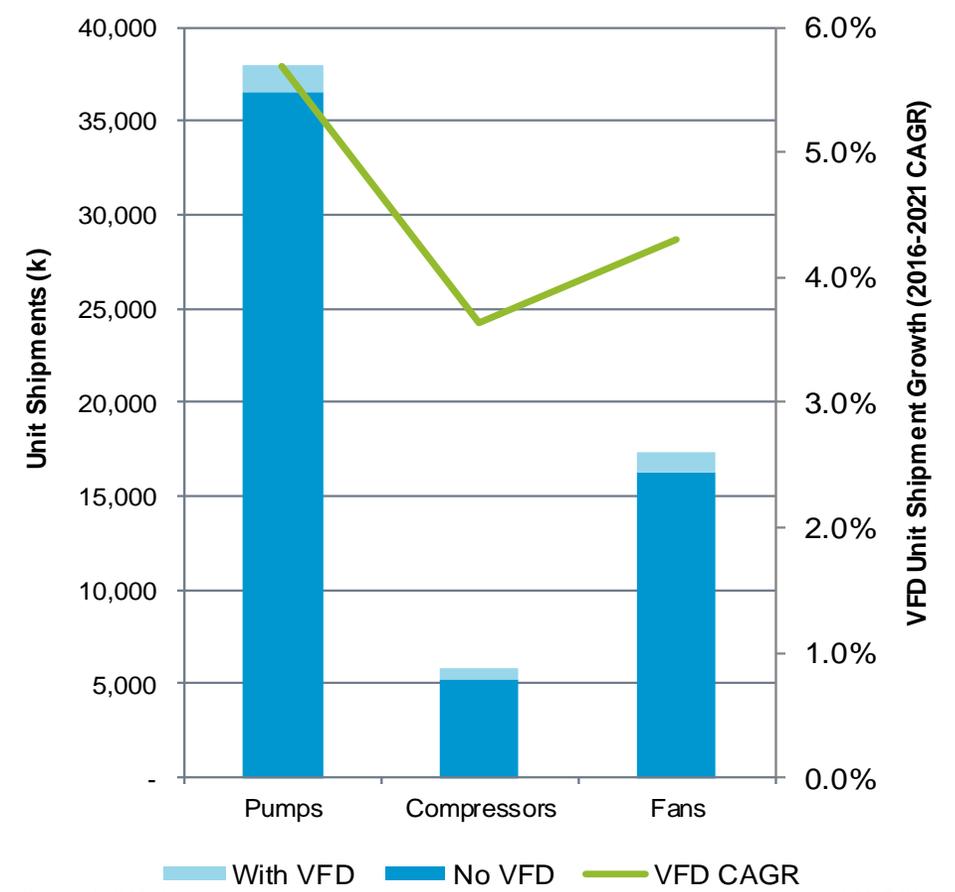
# Importance of pumps, fans, & compressors

- Industrial Internet of Things (IIoT) slow to pick up for these markets
- Low oil prices → smarter technologies
- Suppliers reported an increased focus on packaged systems with VFDs and sensors for process industries
- Technology isn't novel, but the application into properly sized and maintained equipment is
- Training programs educate end users and propel sales of energy efficient motors and drives



## The World Market for Pumps, Fans & Compressors

VFD Penetration



Source: IHS Markit

© 2017 IHS

# Overview of industrial low-voltage drives market (million units)

2017 estimated  
unit shipments

**18.6M**

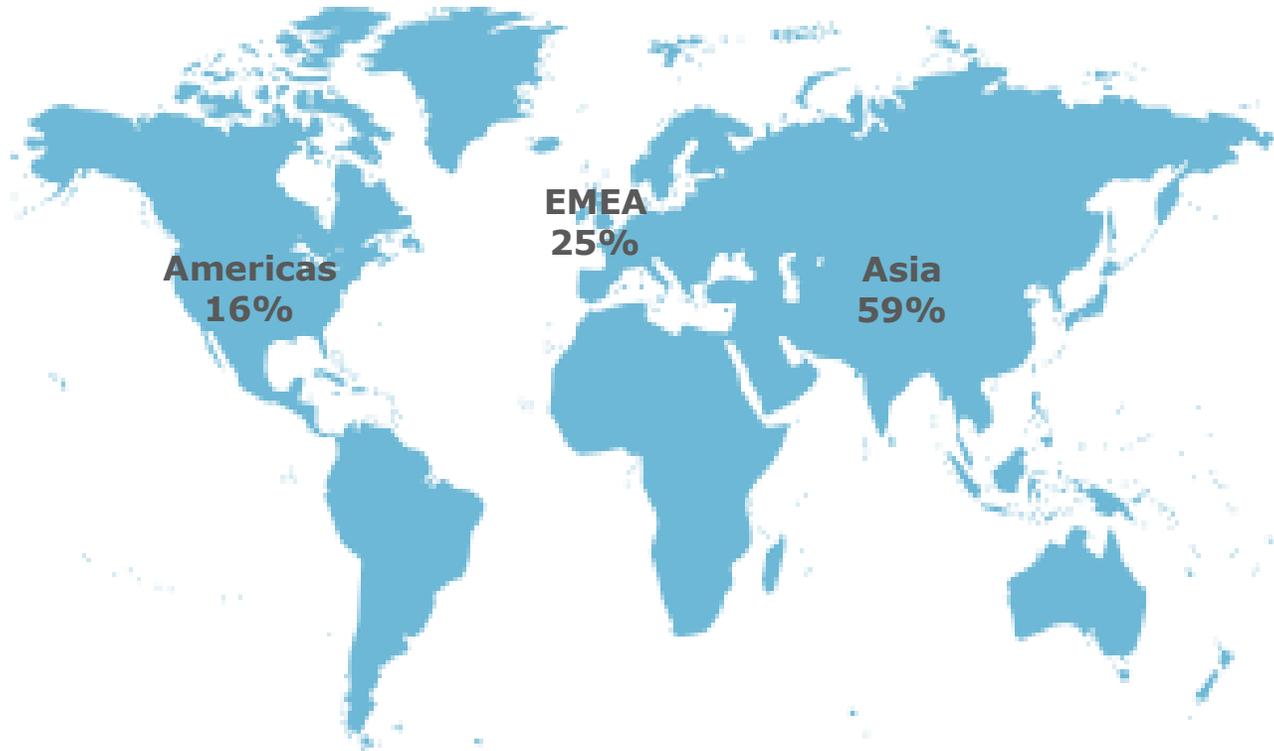
Top-3 Leading  
Suppliers

**ABB**

**Siemens**

**Danfoss**

World shipments by region (%)



Unit shipment CAGR  
(2016-2021)

Americas  
**3.9%**

Asia  
**3.5%**

EMEA  
**3.5%**

# Electric drives overview

## Capital expenditure (CapEx) vs. operating expenditure (OpEx)

- China and India very price sensitive
- Suppliers having to lower cost by substituting materials used (aluminum in lieu of copper)
- Can easily save 30% - 40%, but decision depends type of consumer

## Technology

- Transformerless drives growing in space-needy applications
- Many energy-intensive applications don't utilize drives
  - Large growth prospects in HVAC, water/wastewater, for example
- Electrification is disrupting power transmission applications, but to what extent?
- Drive suppliers focusing on partnerships with data providers/monitors
  - Causes confusion and questions over who owns the data
  - Largely misunderstood currently, but many case studies prove its efficacy

# Market trends

## **Greater focus on services and support**

- Market becoming homogenized – differentiating factors include services
- Failure occurs roughly every 7-8 years, which is too frequent for end users
- Lack of skilled labor and importance of uptime are shaping the market

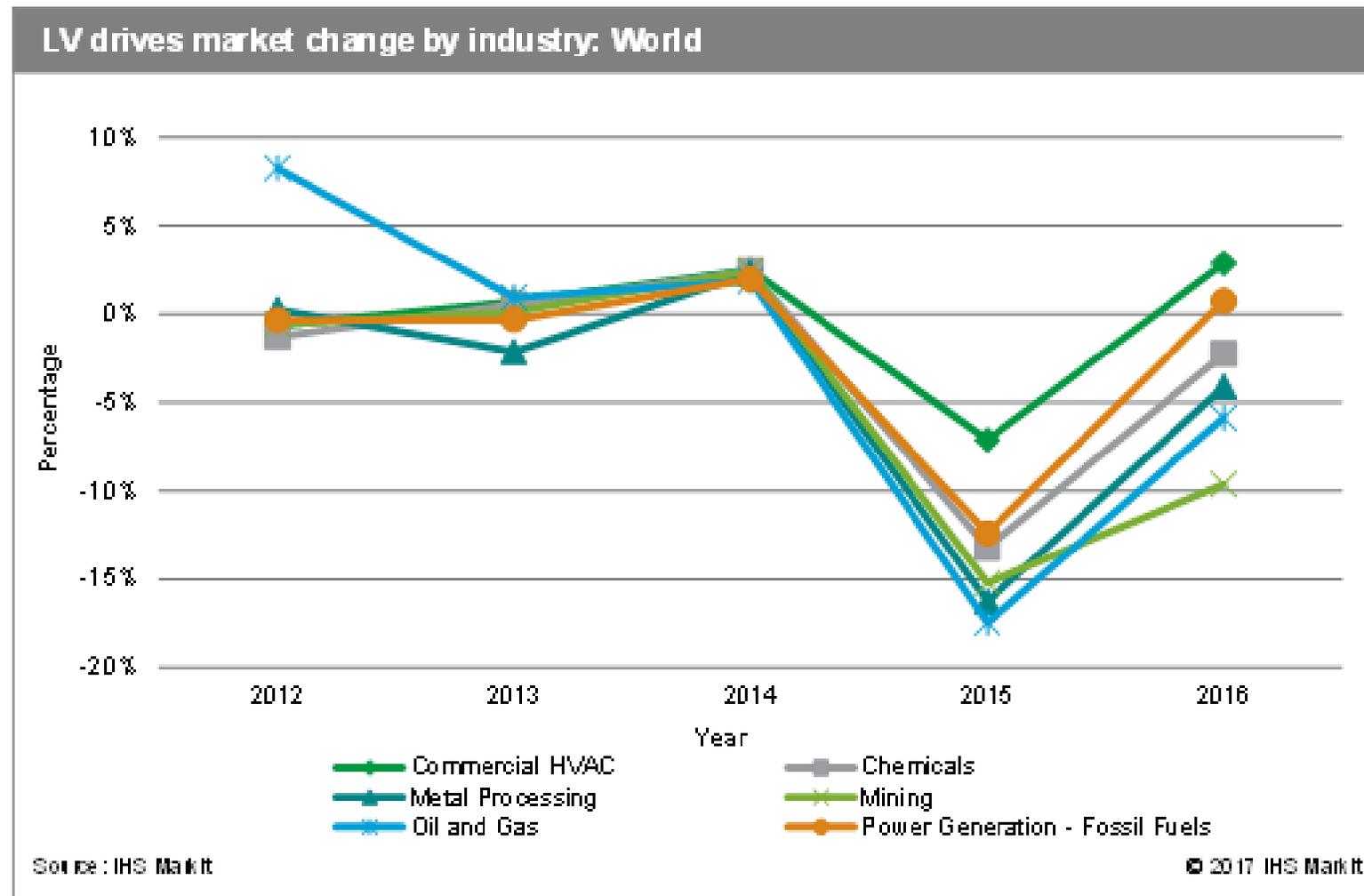
## **Simplification of low-voltage drives**

- Customers wanting less complexity
- Lack of skilled engineering in the workforce
- Cost pressure prominent in pumping and commercial heating, ventilation, air conditioning (HVAC) – non-value adding qualities can be removed

## **Internet of Things (IoT)**

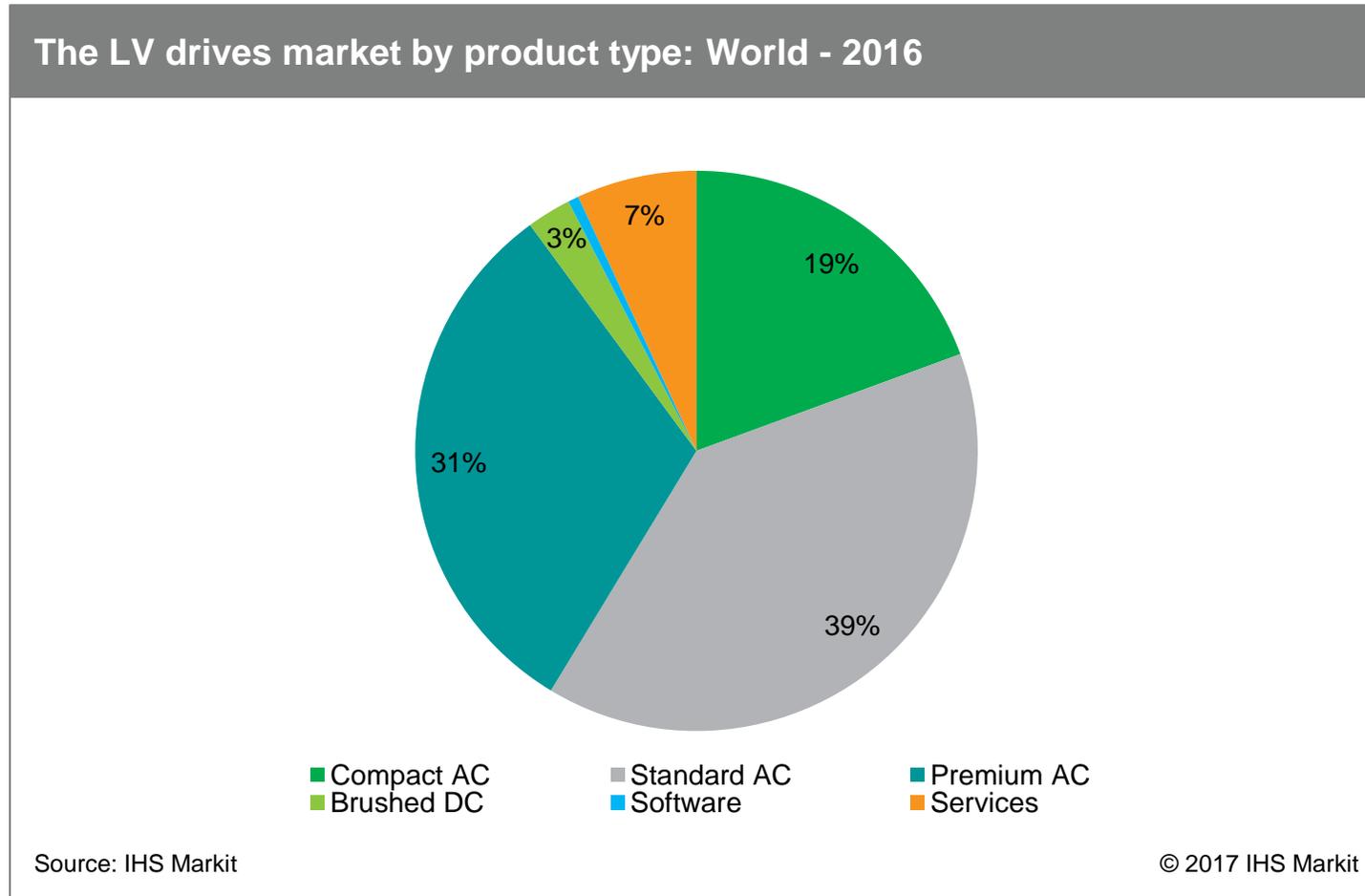
- Low-voltage drives can be used to aid predictive maintenance, increase longevity, and improve connectivity.
- End-users want more information so they can make informed decisions, for this they need more connectivity between machines and components.
- A lot of reluctance to adopt still, mostly due to cost and security concerns

# Discrete industries account for majority of drives



HVAC has been least-effected industry by market downturn; recovered much faster than heavy process sectors

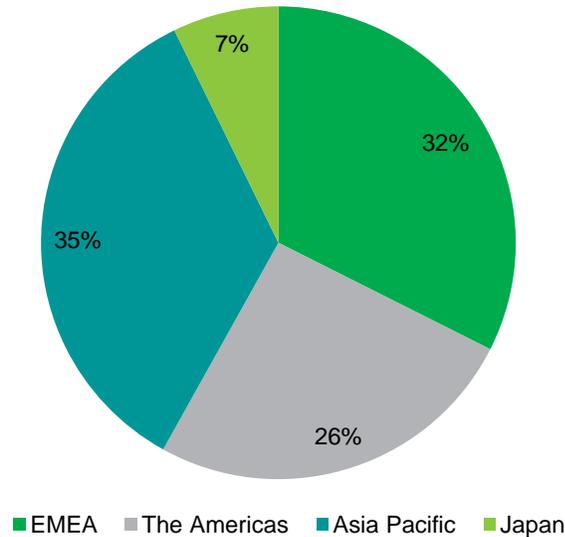
# Consumer demand for variable frequency drives by product type



**Focus on cost savings makes Standard AC more attractive, compact AC most prominent.**

# Asia-Pacific and Japan dominate the drives market

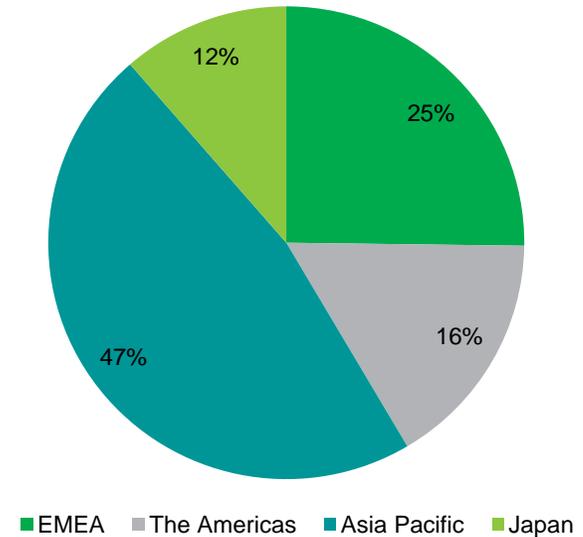
The LV drives market by region: World - 2016



Source: IHS Markit

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LV drive unit shipments by region: World - 2016



Source: IHS Markit

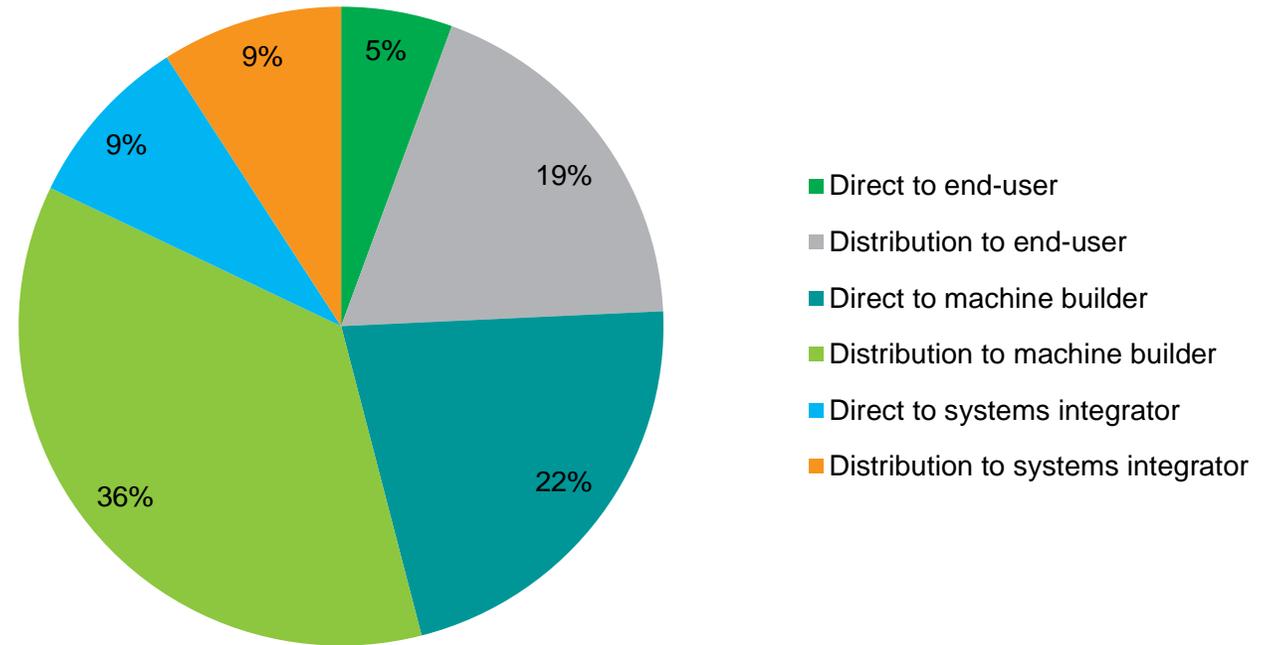
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- **Asia-Pacific (APAC) market worth roughly USD 3.6 Billion, and half of global units**
- **Americas is fastest growing region – contracted least of all regions**
- **EMEA market is largest for services and support revenues in 2016, worth roughly USD 380 million, almost double that of APAC**

# Understanding the sales channel

- Machine builder/Original equipment manufacturer (OEM) is largest channel
- Build speed, reliability, end-user demand, maintenance costs, and efficiency might influence OEMs more so than distributors and contractors
- Machine builders starting to make their own VFDs
- Focusing on low kW applications for HVAC, elevators, and escalators
- Results undetermined: Only affect VFD market? Shakeup the supply chain?

The LV drives market by sales channel: The Americas - 2016



Source: IHS Markit

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# Motor-driven market update



# Overview of the global centrifugal pump market (million units)

2017 estimated  
unit shipments

**30.8M**

Top-3 Leading  
Suppliers

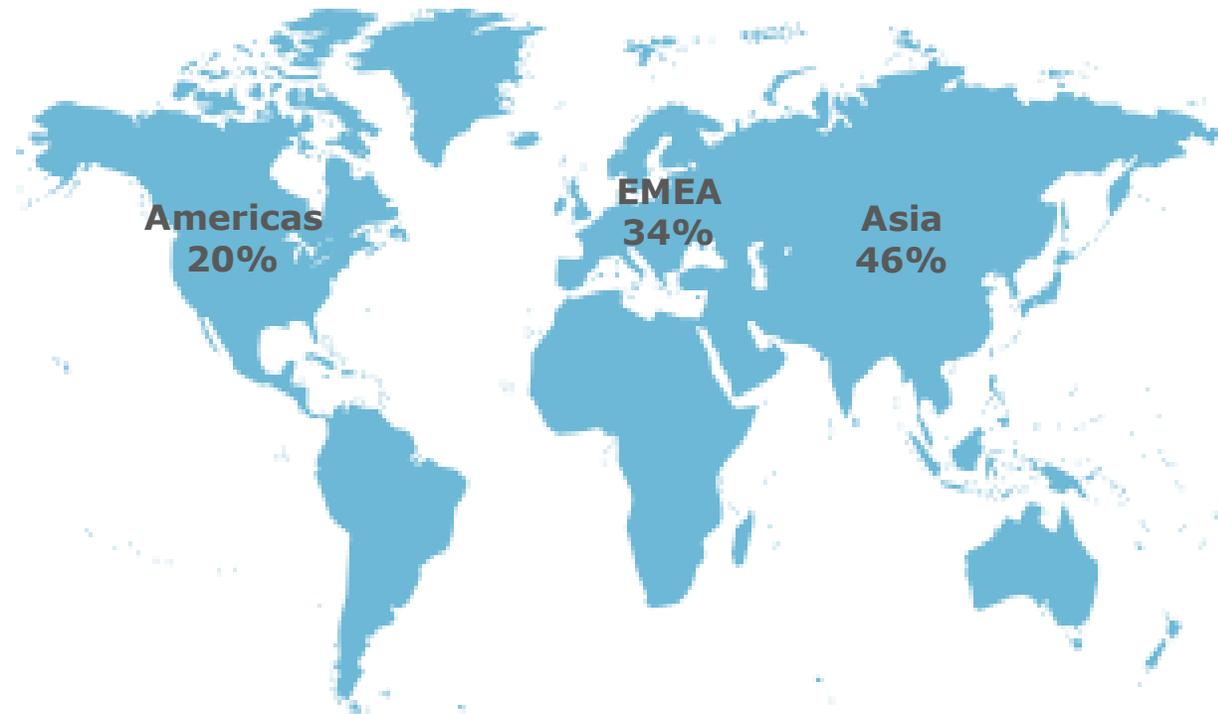
**Grundfos**

**Xylem**

**KSB**



World revenue by region (%)



Unit shipment CAGR  
(2016-2021)

Americas  
**4.2%**

Asia  
**3.8%**

EMEA  
**3.0%**

# Overview of the global positive displacement pump market (million units)

2017 estimated unit shipments

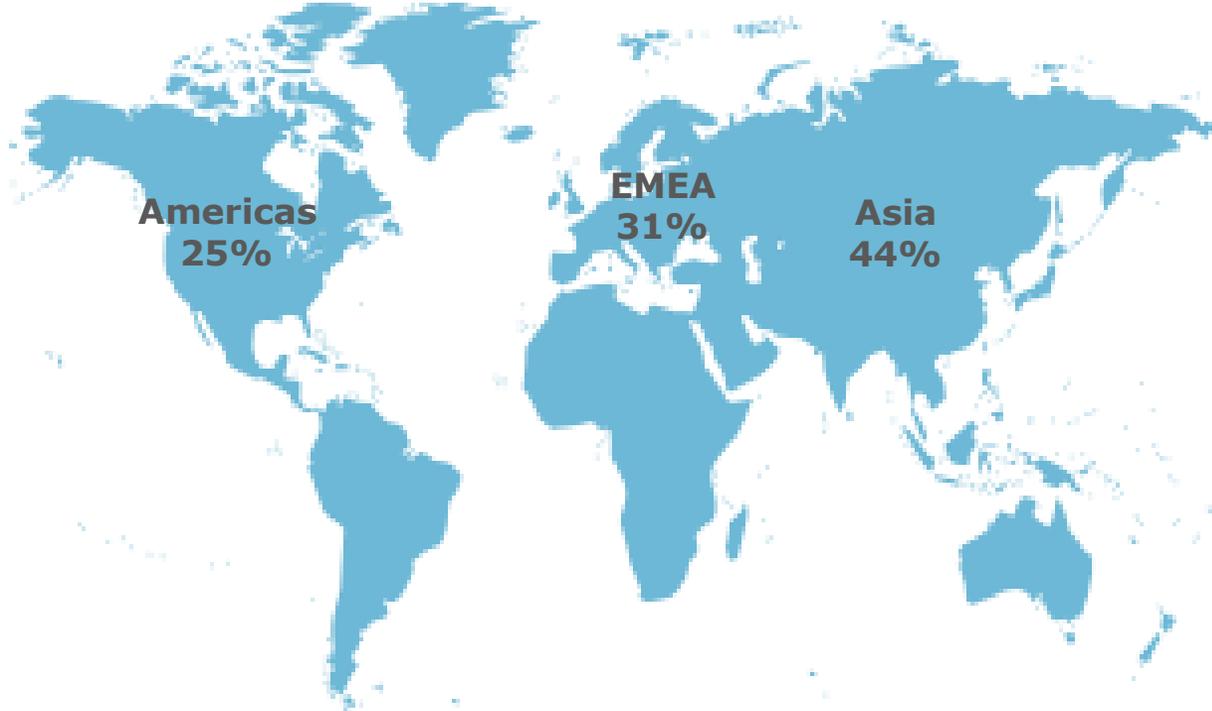
**3.6M**

Top-3 Leading Suppliers

- IDEX**
- Colfax**
- ITT**



World revenue by region (%)



Unit shipment CAGR (2016-2021)

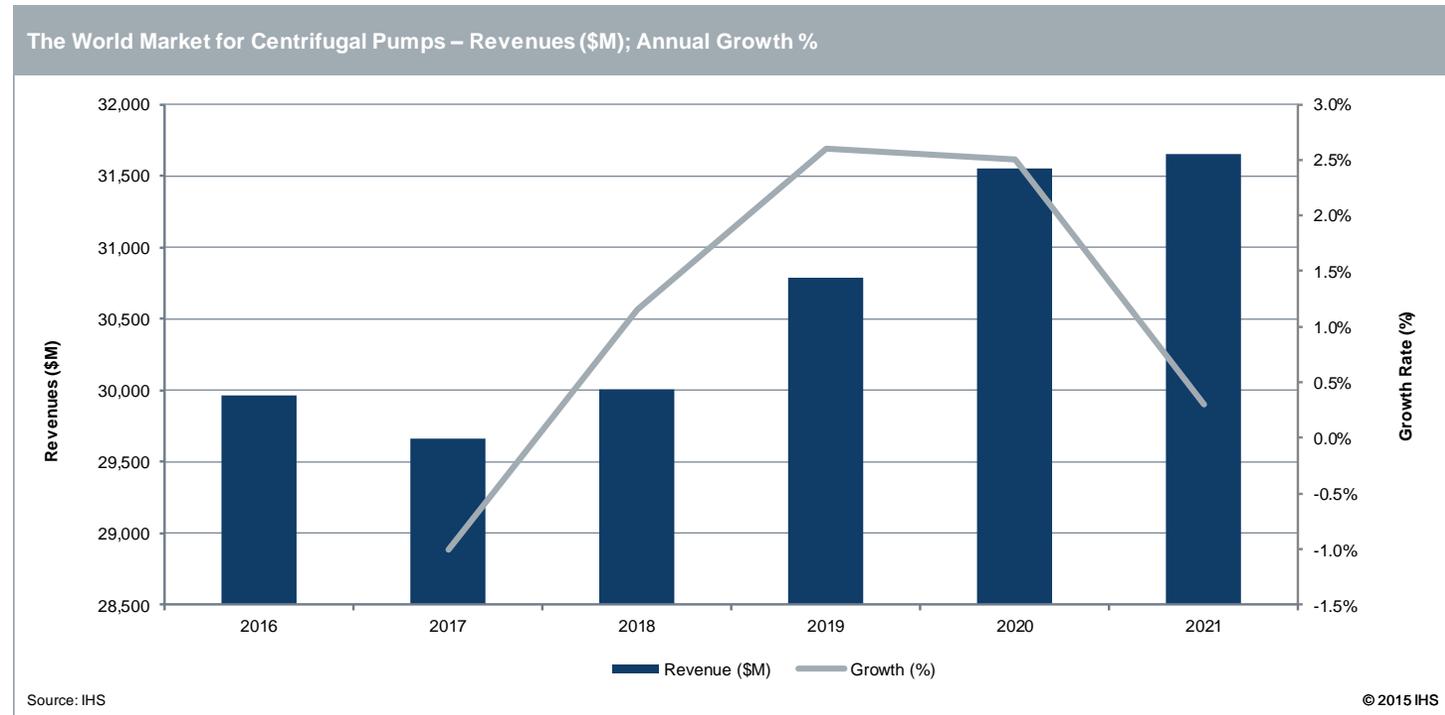
Americas  
**3.1%**

Asia  
**3.3%**

EMEA  
**2.6%**

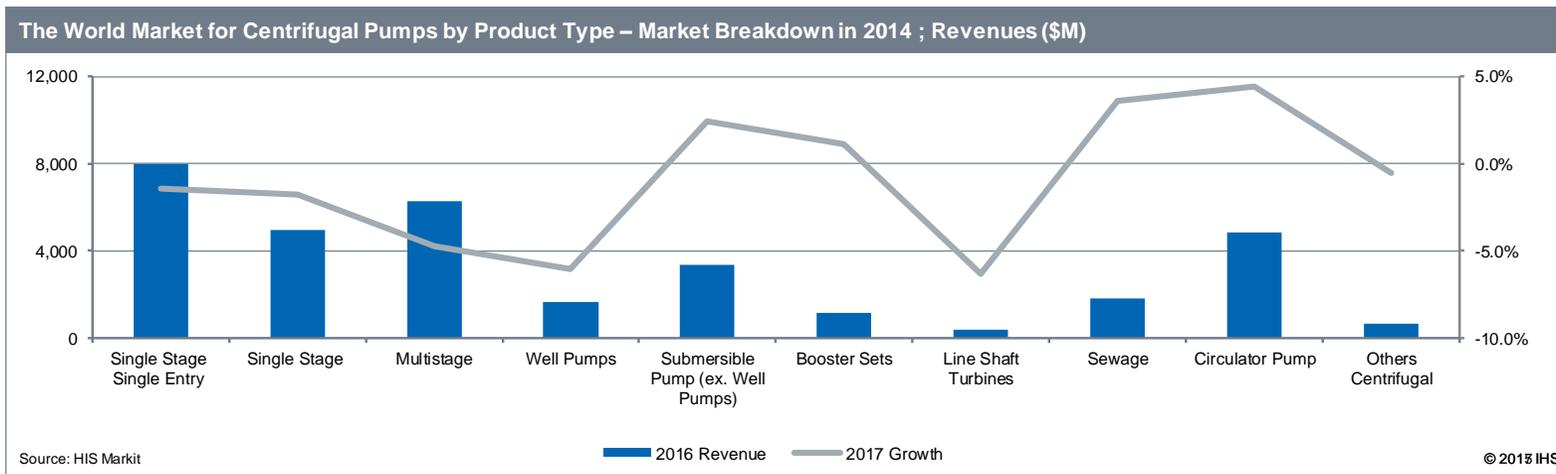
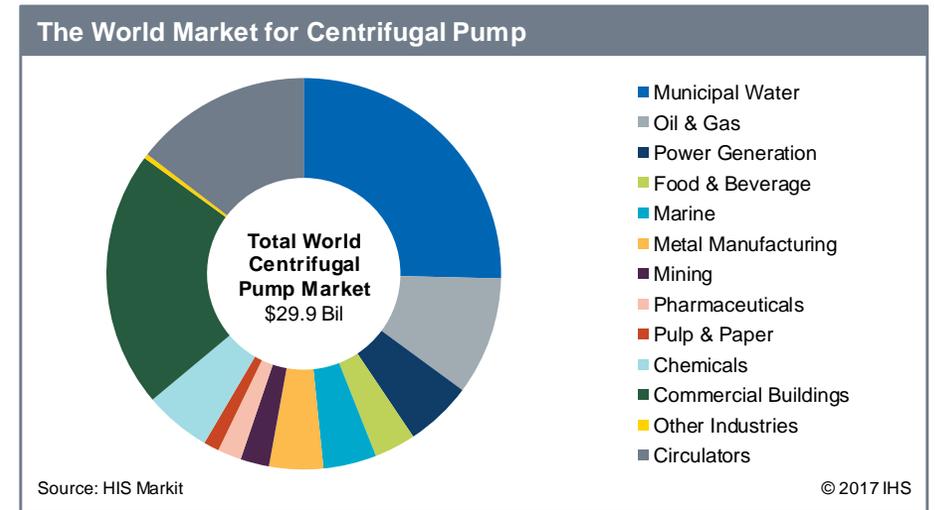
# Market development

- Tempered growth expectations for **Oil & Gas**
- China investment levels also tempered until 2019
- Strong commercial, power generation, and infrastructure development

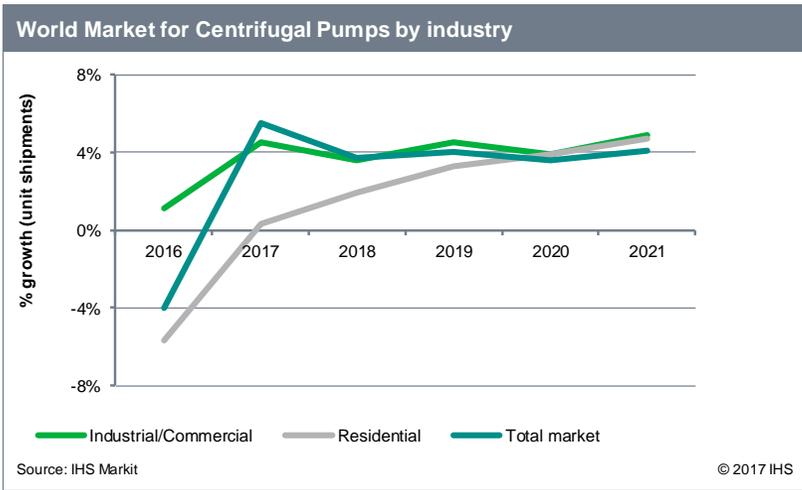


# Market development (cont.)

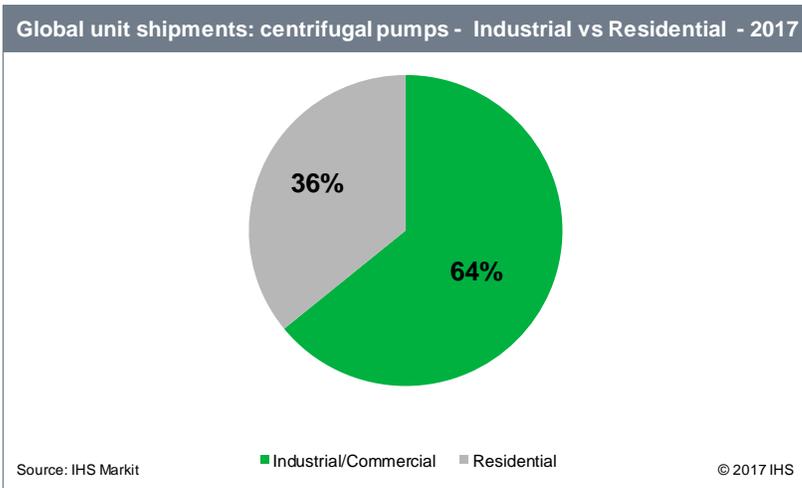
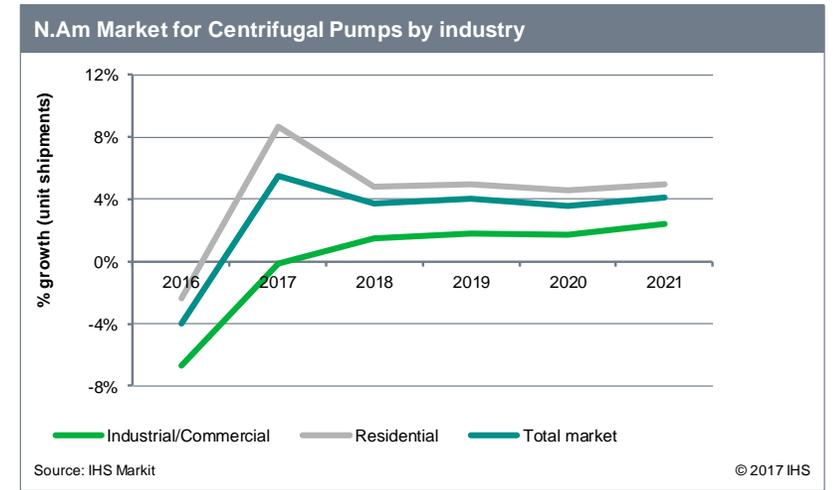
- Process industries depressing market growth since 2014
- Circulators and other commercial/residential areas poised for strong growth
- Submersible pumps benefit from urbanization, especially in Middle East, India, South East Asia
- Water and building services account for > 50% of market



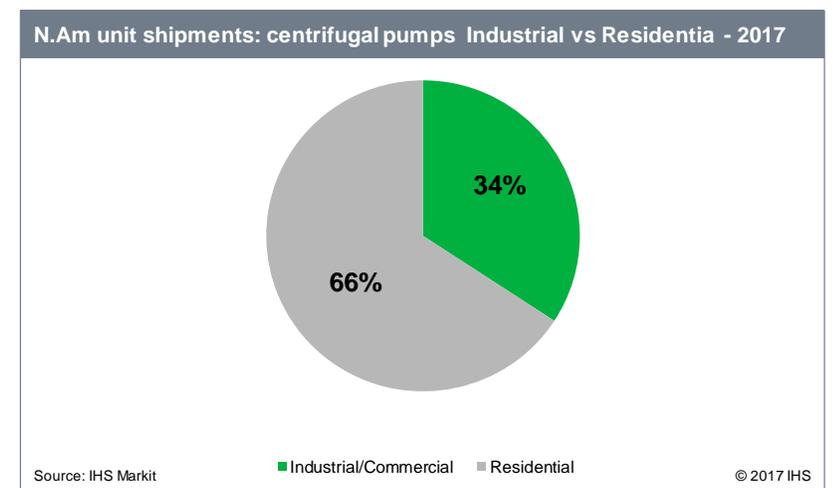
# Market development (cont.)



Residential growth in Americas prominent



Hurricane 2017 recovery and new home builds



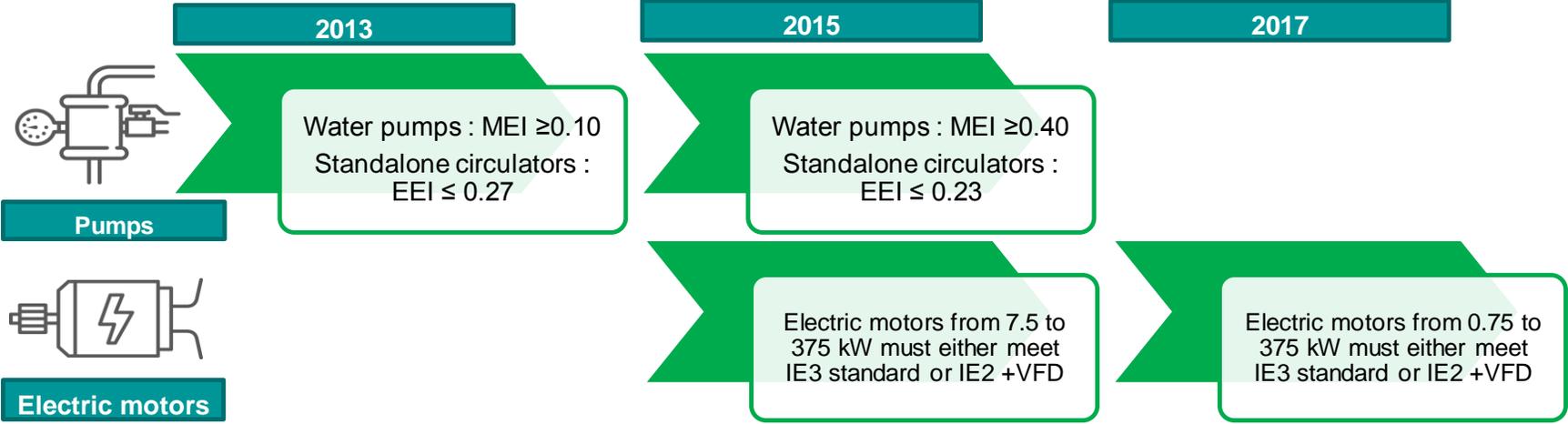
# Key trends

## Efficiency Ratings and Regulations

- All major regions looking to incorporate a full system consideration for pumping systems
- Major focus on pumps, fans, and compressors – Department of Energy cuts could be hindrance
- Market still not 100% compliant - surveillance is lacking, as with motors and drives
- Likely not going to increase prices as with motor energy efficiency requirements

## Market readiness and expected implications

- Hydraulic efficiency → proper training and customer interaction
- Usually pump customer is not paying the bills
- Market consolidation possible
- Partnerships and adoption of IoT expected to increase drastically
- R&D expenditures surging



# Product and technological innovations

Increasing importance to become more of a solutions provider, as opposed to components

## **Digital transformation in the manufacturing lines**

- Centrifugal pump manufacturers undergoing digital transformation; embracing the Industrial Internet of Things (IIoT), big data and artificial intelligence
- Allow for organizations to gain competitive advantages.
- Intelligence being embedded into devices, supporting decentralized analytics and decision making
- Augmented reality technology rolled out in some cases as training method to replace paper instructions

## **Enhance user experience with a full integrated solution.**

- Communication is a key to digitalization in the world of Internet of Things (IoT)
- Pump suppliers have been pushed more than ever to become an integrated solution provider.
- Connected pumps enable predictive maintenance and increase efficiency.
- Oil and gas, water and wastewater, and commercial building sectors are the biggest adopters of IoT technology
- Additive manufacturing technology has had impact on the spare parts service market.
- 3D printing technique to reproduce spare parts that are difficult to obtain or are no longer available on shelf.
- Enables continued operation of existing system and eliminates the need for extensive modification by the end-users.

# Overview of the global fan and blower market (million units)

2017 estimated  
unit shipments

**289.6M**

Top-3 Leading  
Suppliers

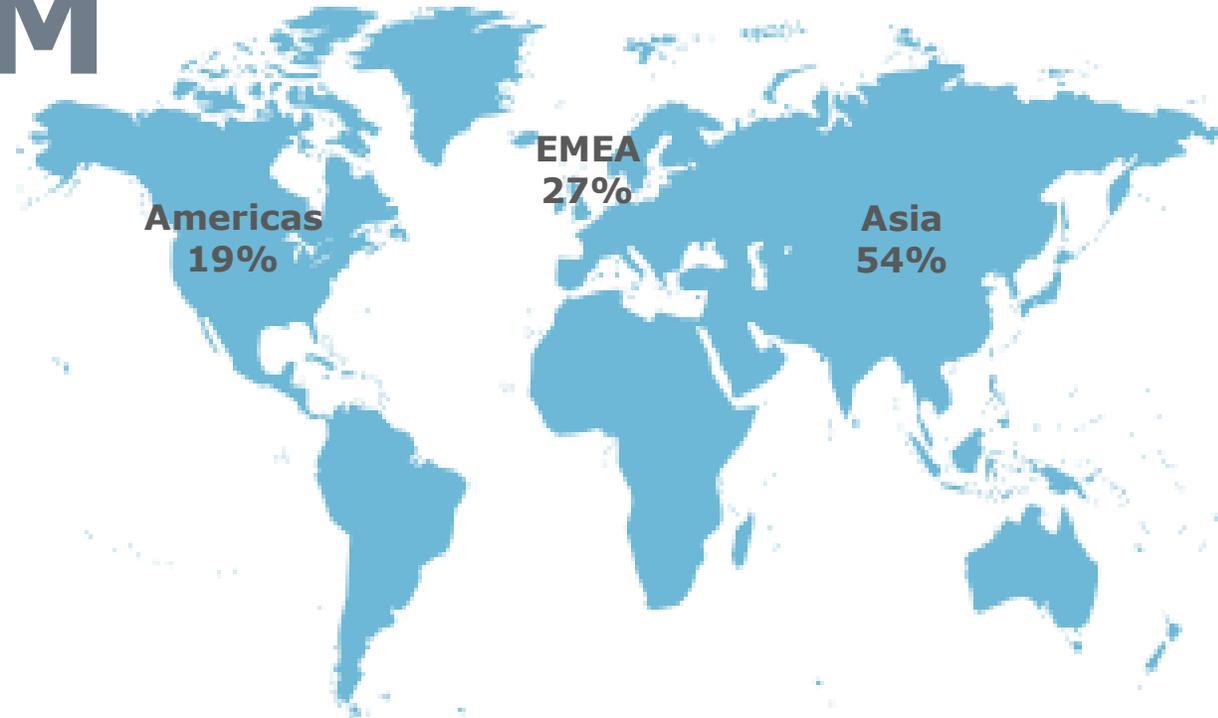
**Daikin**

**EBM-Papst**

**Ziehl-Abegg**



World revenue by region (%)



Unit shipment CAGR  
(2016-2021)

Americas  
**2.3%**

Asia  
**2.7%**

EMEA  
**1.9%**

# Overview of the global industrial compressor market (air & gas)

2017 estimated  
unit shipments

**7.5M**

Top-3 Leading  
Suppliers

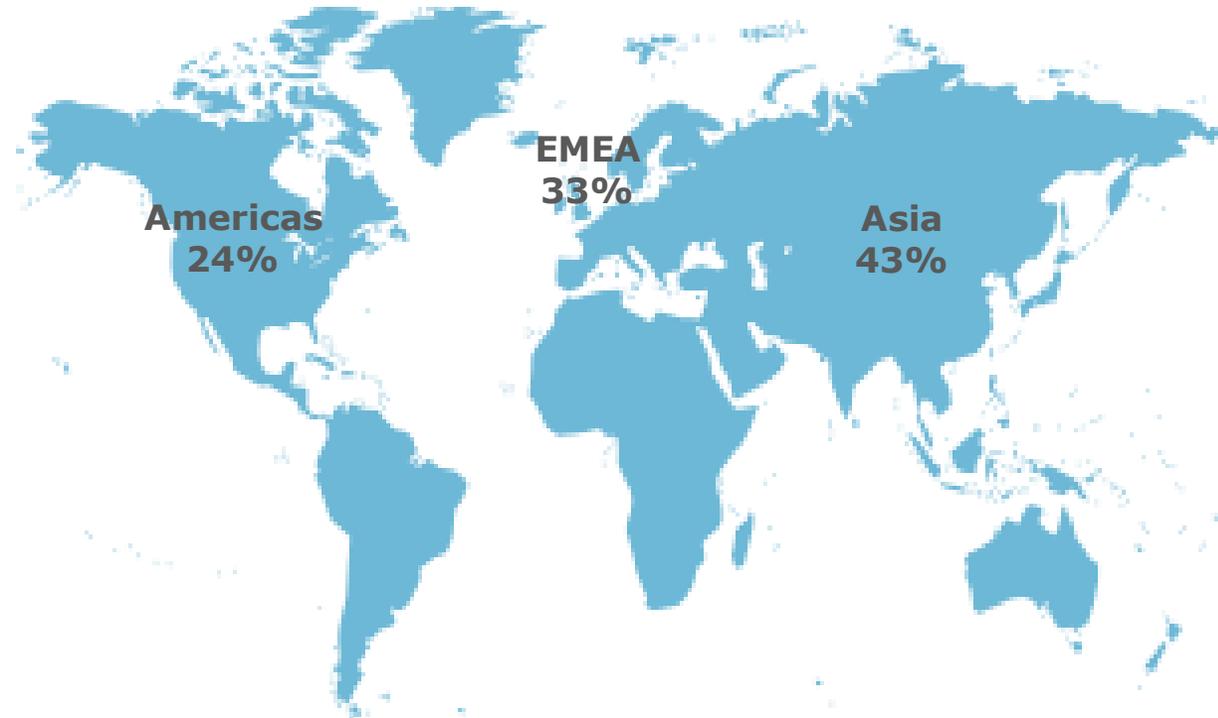
**Atlas Copco**

**Ingersoll**

**Fusheng**



World revenue by region (%)



Unit shipment CAGR  
(2016-2021)

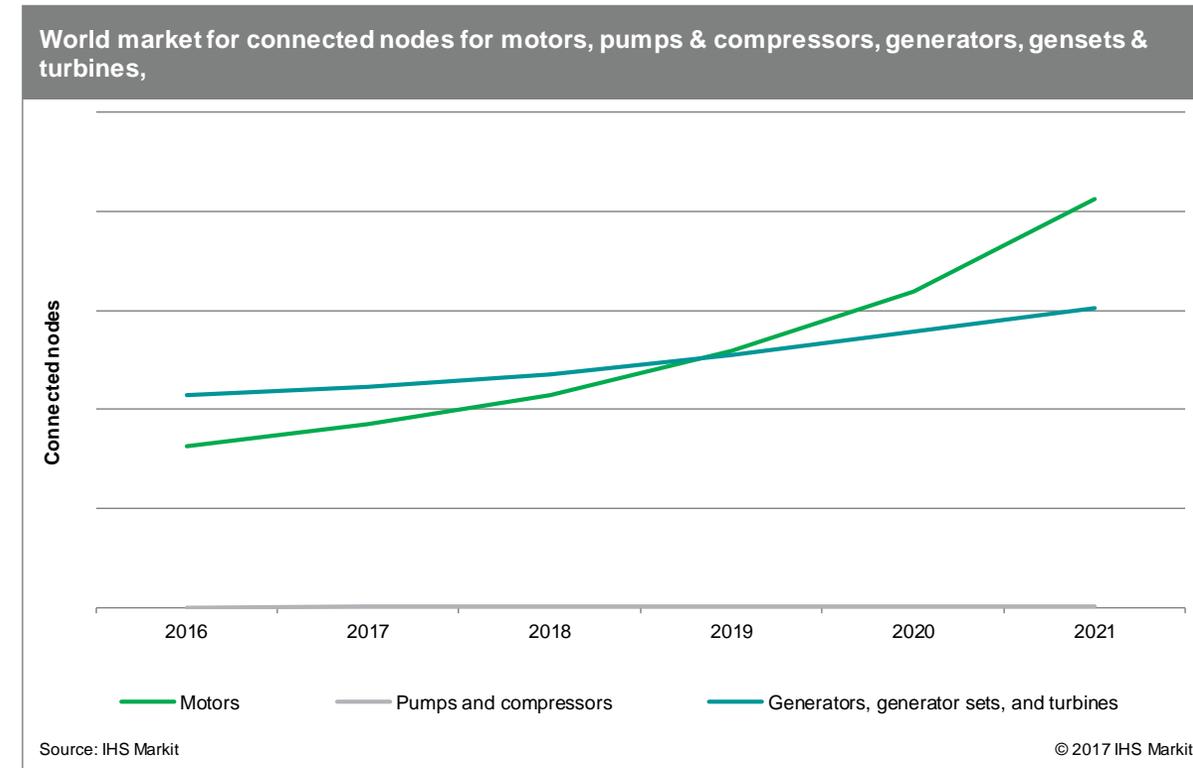
Americas  
**2.0%**

Asia  
**3.1%**

EMEA  
**1.5%**

# Motor-driven equipment connectivity trends

- Growth for connected nodes in motors, Motor-driven equipment and controls will be more than 11% through next 5 years
- Predominantly Fieldbus networking technologies, however, Ethernet is accelerating in growth.
- Cloud connectivity is forecast to appear on more devices from 2018 onwards.
- Generators, Gen-sets & Turbines have the highest amount of enabled and connected nodes. Expected to surpass 1.5 million connected nodes by 2021.
- Pumps & compressors have 45% CAGR through 2021
- Predominantly Ethernet networking within pumps & compressors.
- Pumps & compressors have a low connected nodes but due to continue to be connected as IIoT drives connectivity forward.

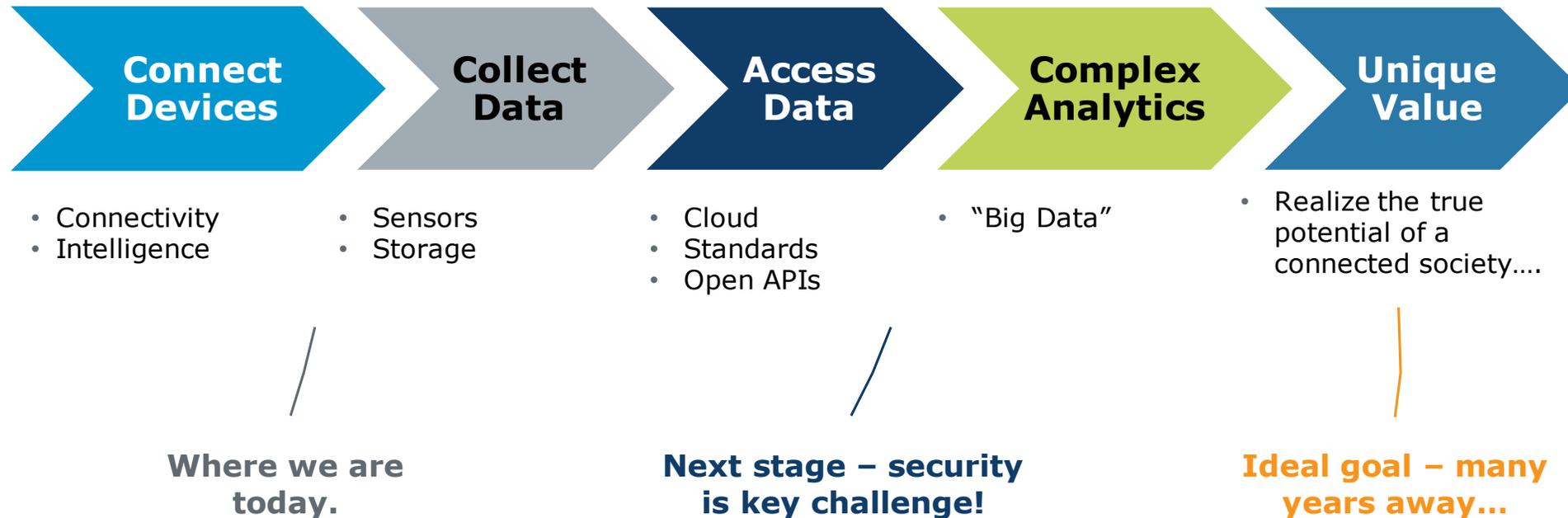


# Emerging technology: Internet of Things

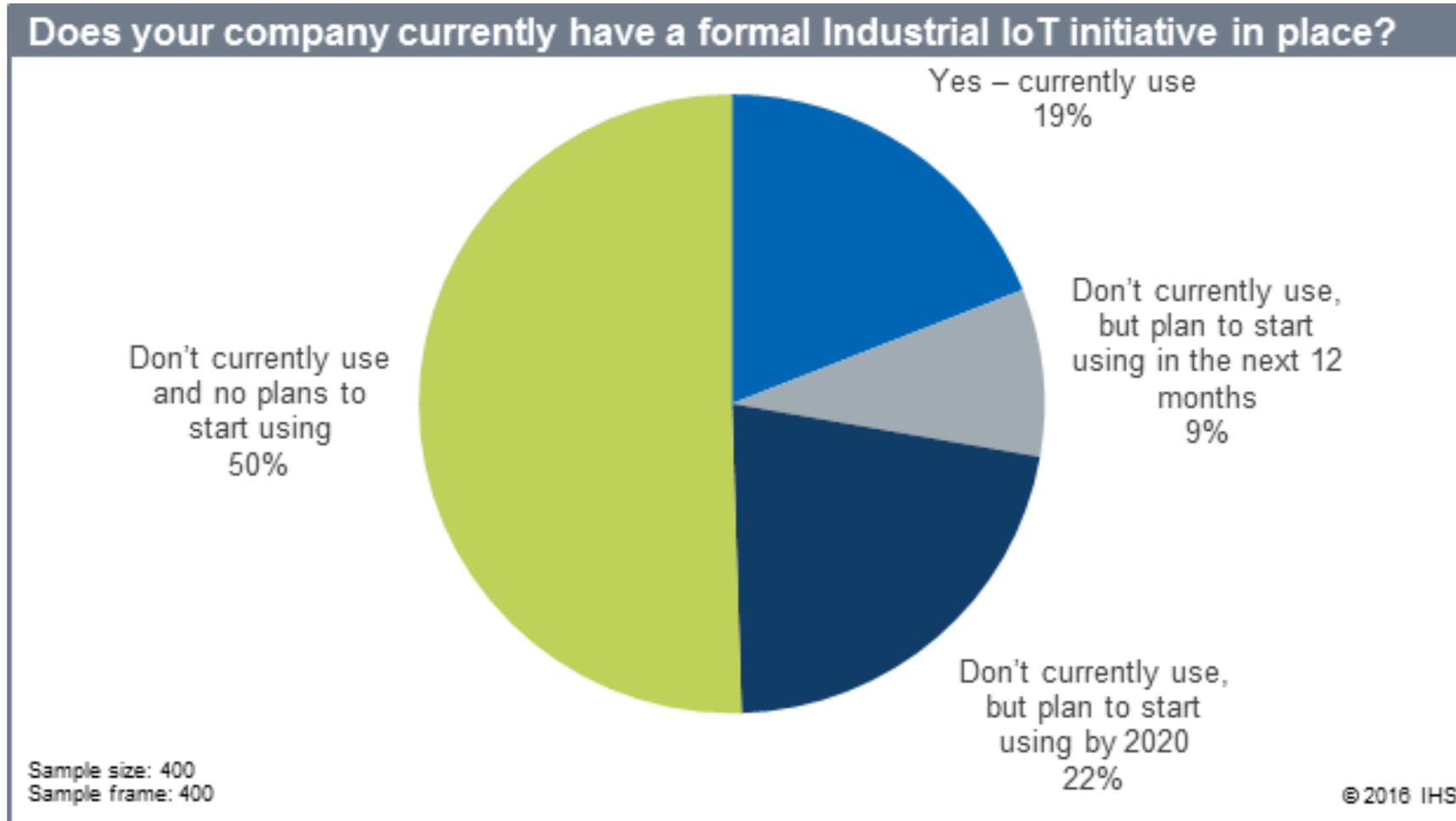


# Internet of Things evolution

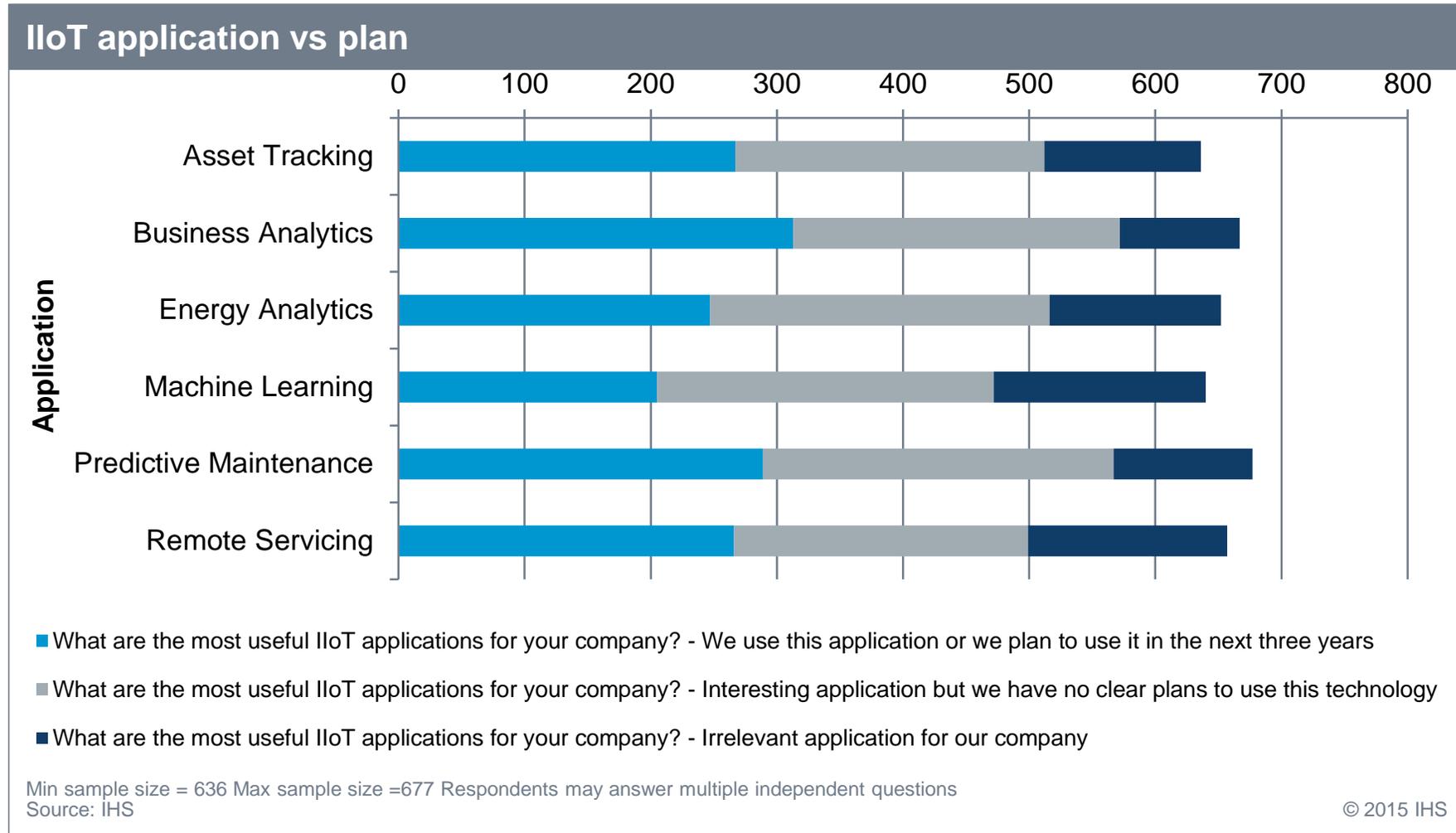
**Internet of Everything (IoE):** represents the open access to data from one or more monitoring and control systems by third-party applications to provide unique, additional value to stakeholders.



# Internet of Things survey



# What do customers want from IIoT?



# Enablement vs. connectivity

## LV motor drives

66.7% enabled  
60.5% new nodes connected

## MV motor drives

79.5% enabled  
85.4% new nodes connected

## Servo drives

80.5% enabled  
96% new nodes connected

## Stepper drives

54.1% enabled  
74.5% new nodes connected

## Motors

4.7% enabled  
9.6% new nodes connected

## Pumps & compressors

0.1% enabled  
2.2% new nodes connected

## IPCs

100% enabled  
66.5% new nodes connected

## Motion controller

90% enabled  
6.5% new nodes connected

## Generators & turbines

47.3% enabled  
100% new nodes connected

## Coming to "end-equipment"

## PLCs

77.2% enabled  
92.2% new nodes connected

## Operator terminals

82.5% enabled  
89.2% new nodes connected

## Remote I/Os

92.7% enabled  
78.3% new nodes connected

## Sensors

23.3% enabled  
8.9% new nodes connected

## Machine vision

100% enabled  
100% new nodes connected

## DCS

94.1% enabled  
80% new nodes connected

## Discrete machine-safety

29.2% enabled  
84.7% new nodes

## Process controller

15.8% enabled  
48.5% new nodes connected

## Process safety

100% enabled  
100% new nodes connected

## RTU

100% enabled  
90.8% new nodes connected

## Process Instrumentation

85.4% enabled  
13% new nodes connected

# Existing applications for IoT

## Design

- **Harley-Davidson**  
Reduced model New Product Introduction (NPI) from more than a year to 1.5 weeks
- **Maserati**  
reduced number of prototypes, and time to market resulting in 30% less development time.

## Operations

- **Petroflow Energy Corp.**  
*Site power consumption reduced by 43%*
- **Marathon Petroleum Company**  
Alarm rate reduced by approx. 90%
- **Husky Injection Moulding**  
productivity and cycle time gained from 3% to 12%

## Maintenance

- **CNH Industrial**  
average maintenance time reduced by 50%
- **Fanuc**  
Saved US\$2M from reduced downtime
- **Nova Chemicals**  
reactive emergency work reduced by 47% and time spent on proactive, preventative maintenance has increased by 61%

## Supply Chain

- **Sandvik Coromant**  
Monitors existence of any bottlenecks in the overall supply chain
- **Shanghai CHILO Press Company**  
Inventory error rate reduced from 50% to 4% within 6 months. Inventory control converted US\$95k loss to a US\$158k profit

# Conclusion

## Key Takeaways:

- Efficiency will improve, but IoT has brought forth other solutions that can dwarf the benefits of simply buying one efficient product
- Motor, drive, and pump/fan/compressor suppliers still enduring hard times; but strong opportunities exist (construction, commercial HVAC, water, food and bev)

## Notable actions:

- Full solution offerings continue to be a better business model than niche product manufacturing
- Uptime as a service is likely the future
- This means that major suppliers are looking insert themselves all along the supply chain to best understand customer needs

# Thank you!

- **Preston Reine**
- **Research Manager, IHS Markit**
- **+1 512 582 2059**
- **[Preston.reine@ihsmarkit.com](mailto:Preston.reine@ihsmarkit.com)**

