ASET-EU

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Regulation and Enforcement [surveillance] Consequences

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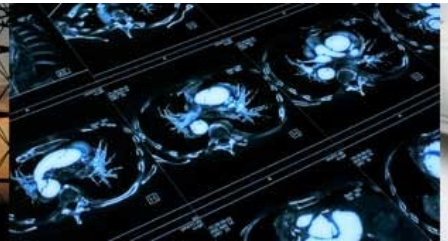
The Association of Electrical and Medical Imaging Equipment Manufacturers

Regulation and enforcement [surveillance] consequences

- Current US regulatory scope
- Global supply chain
- Then and now – what's changed over twenty plus years of regulation?
- Supply chain impact on energy savings success
- Understanding the enforcement challenge
- Multiple government agency collaboration
- First steps to securing a border from non-compliant product
- Conclusions
- Next steps to saving more energy

Terms and acronyms

- DOE = US Department of Energy
- NEMA = National Electrical Manufacturers Association
- Small motors = 1/6 to 3 horsepower
- Integral motors = 1 to 500 horsepower
- NOPR = Notice of proposed rule
- HLS = home and security
- CBP = customs and border patrol
- ACE= automated commercial environment
- CCMS = compliance and certification management system
- ITDS = international trade data system
- HTS code = harmonized tariff schedule

US Motor Efficiency Regulation Timeline

1992

- Energy Policy Act of 1992 covered in CFR10 part 431

- NEMA MG1 Table 12-11 is often referred to as Epact92 or IE2

1997

- EPAct production in effect

- 1 thru 200HP TEFC & ODP general purpose motors

2005

- NEMA Premium® required by law for all federal facilities FEMP

2007

- Energy Independence and Security Act of 2007

- Amended the Energy Conservation Standards for Electric Motors Provided Under EPAct 1992

- Established Energy Efficiency Standards for a Broader Scope of Electric Motors, Not Previously Covered

2009

- Subpart X – Small Electric Motor Regulation Established

2010

- EISA in effect NEMA Premium® Levels Required on some motors

2015

- Small Motor Regulation Production Required March 9, 2015

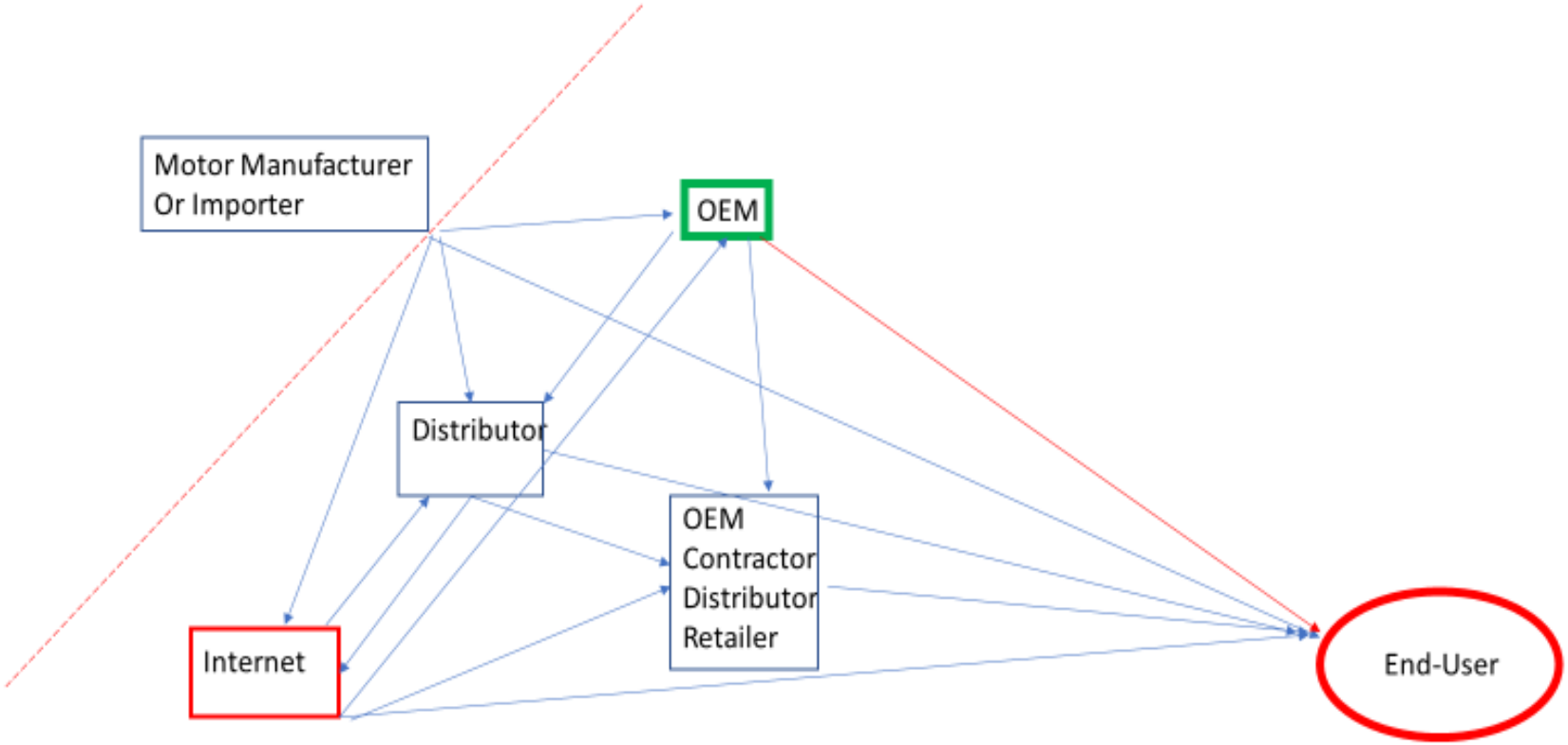
2016

- Expanded 2013 EISA Regulation Implemented June 1, 2016

We were naïve

- 1990's motor manufacturers have no understanding of government regulation
- Efficiency tables and test methods exist
- NEMA standards were not written to support regulation
- The internet did not exist
- Members believed they represented over 80% of units sold in US

Global Supply Chain Today



How has supply changed

- **Internet**
  - Access to a wide range of customers
  - Product data
- **The actual number of suppliers [single day search results]**
  - 618 million hits for electric motor for sale
  - 135 million for AC
  - 107 million for DC
- **Over 250 motor manufacturers on line**

Basic tenent of efficiency regulation

- **Efficiency regulations**
  - Establish savings per unit based on applications, hours of use and lab tested efficiency gains
  - Aggregated savings calculation based on estimated market data in detail by motor type, power level, application
  - No deflator used to address imported non-compliant product

Market impact driving enforcement concerns

- **Motor manufacturers**
  - Unfair competition loss of market
- **Equipment builders using regulated motors**
  - Unfair competition loss of sales
- **Distributors**
  - Unfair competition loss of sales
- **End-Users – Regulators**
  - Unrealized energy savings

The challenge to border enforcement

- **Import conditions**
  - Motor [cc numbers]
  - Systems covered approximately 150 HTS codes
- **Documentation**
  - Import documents
  - Product marking
- **Certification**
- **Liable party = Importer of Record**

Partial of systems HTS codes

8413 Pumps for liquids, whether or not fitted with a measuring device; liquid elevators; part thereof

8414 Air or vacuum pumps, air or other gas compressors and fans; ventilating or recycling hoods incorporating a fan, whether or

not fitted with filters; parts thereof

8415 Air conditioning machines, comprising a motor-driven fan and elements for changing the temperature and humidity, including

those machines in which the humidity cannot be separately regulated; parts thereof

8416 Furnace burners for liquid fuel, for pulverized solid fuel or for gas; mechanical stokers, including their mechanical grates,

mechanical ash dischargers and similar appliances; parts thereof

See CRF 10 part 429 for the complete list of 150 HTS codes proposed by DOE to be covered by the import declaration

Embedded imported motor examples

Government agencies

- **Department of Energy**
  - Issues regulations [2] Test and MEPS
- **Homeland Security**
  - Federal agency responsible for broad security measures
- **Customs and Border Patrol**
  - Law Enforcement Agency
    - Responsible for border enforcement of US laws including MEPs

Enforcement

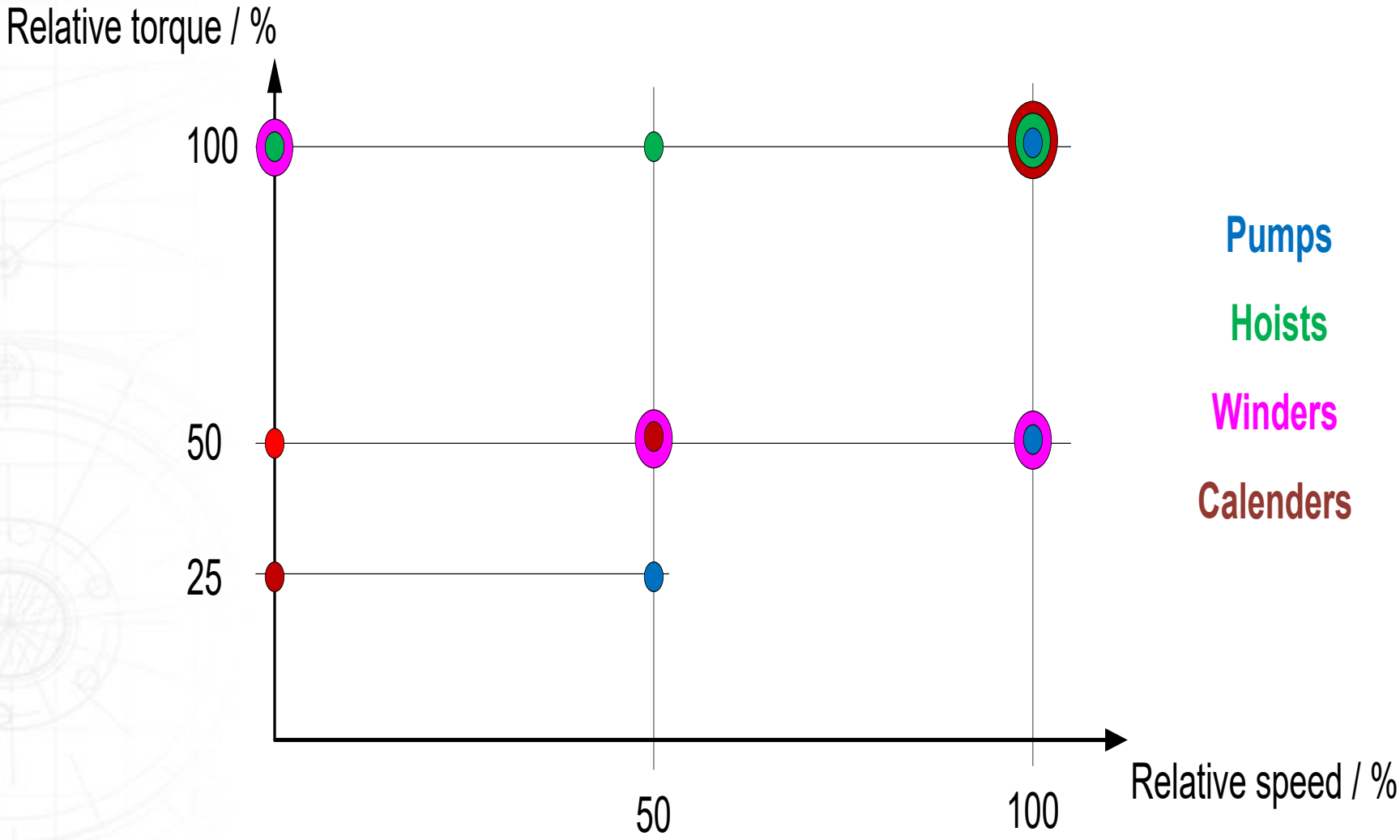
- **Customs and Border Patrol = owner**
- **MEPS enforcement**
  - Documented Funded Import Declaration Procedure
- **Utilizes existing CBP systems/tools**
  - ACE= automated commercial environment
  - CCMS = compliance and certification management system
  - ITDS = international trade data system

Enforcement Conclusions

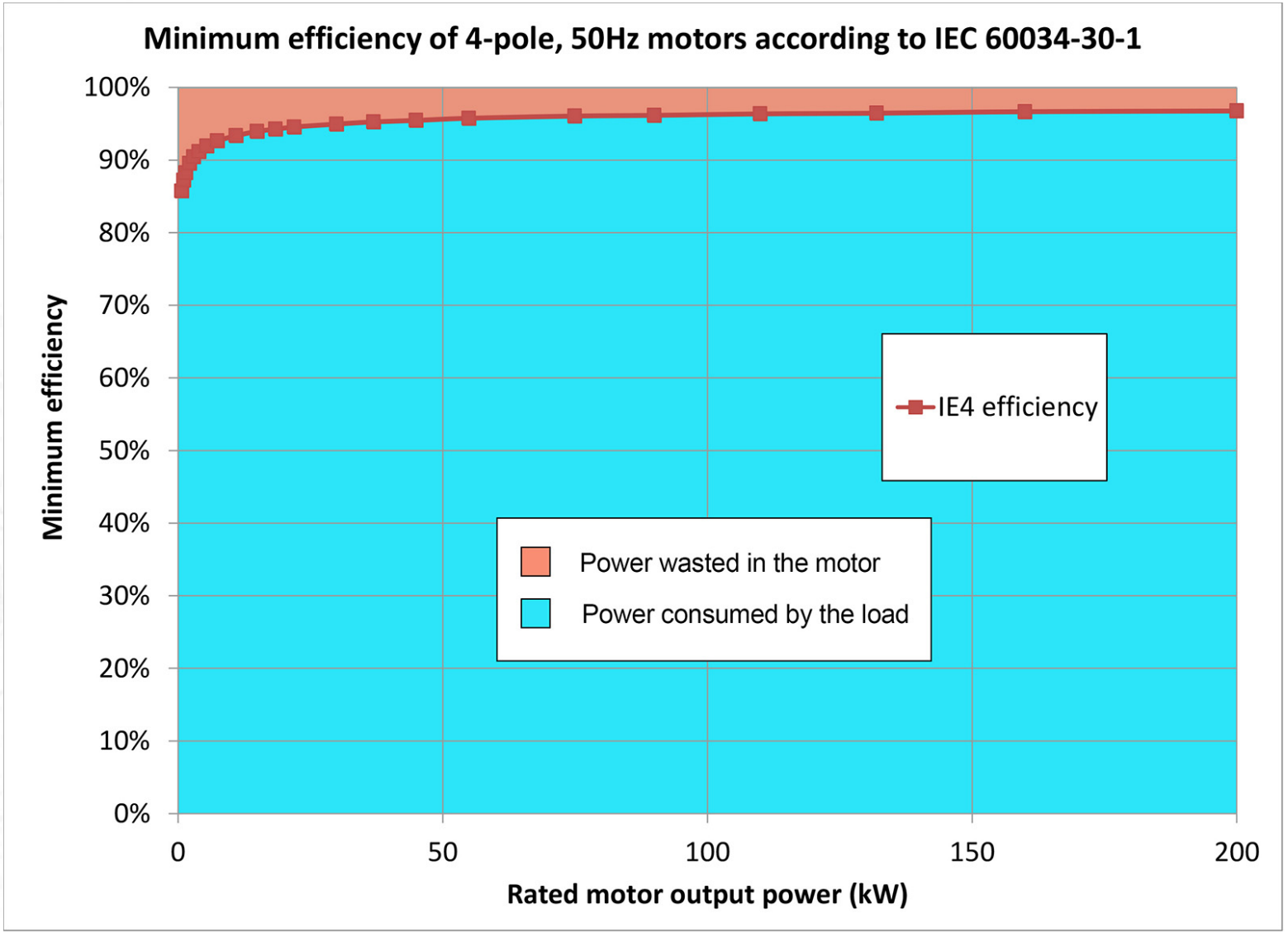
- Tremendous change has occurred since the first motor MEPS regulation in 1992.
- A combination of the internet and technology has introduced hundreds of additional global sources.
- Expanding product scope to smaller motors adds millions of units per year.
- The US regulators have recognized that a lack of enforcement will negate much of the current and future energy savings from market estimates.
- NEMA will continue to support strong border enforcement of all motor regulations.

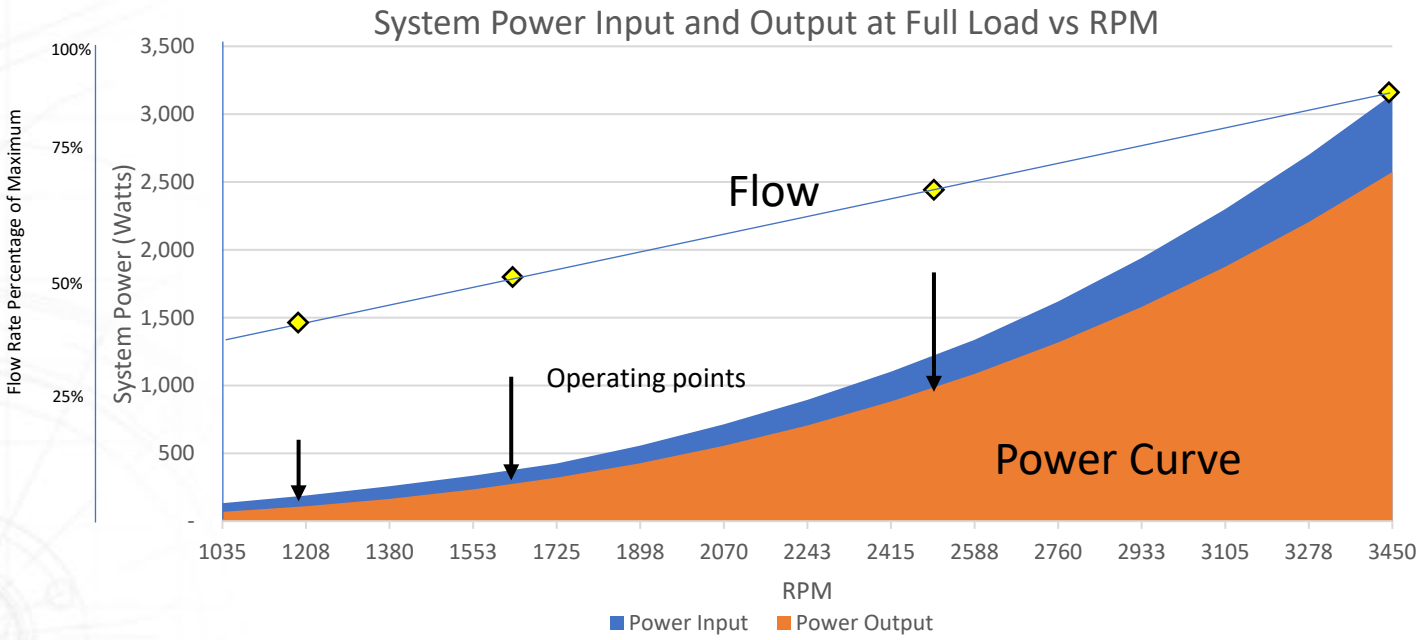
What does the future hold?

- Suppliers and regulators have concluded component performance has reached a point of diminishing returns [rebound]
- Motor system technologies have expanded dramatically
- The digital revolution has reached the motor system
- Regulators and governments have begun to view software as the next energy savings tool
- International standards are beginning to address systems
  - 61800-2-9 PDS loss determination


Relative torque / %
100
50
25
50
100
Relative speed / %
Pumps
Hoists
Winders
Calenders

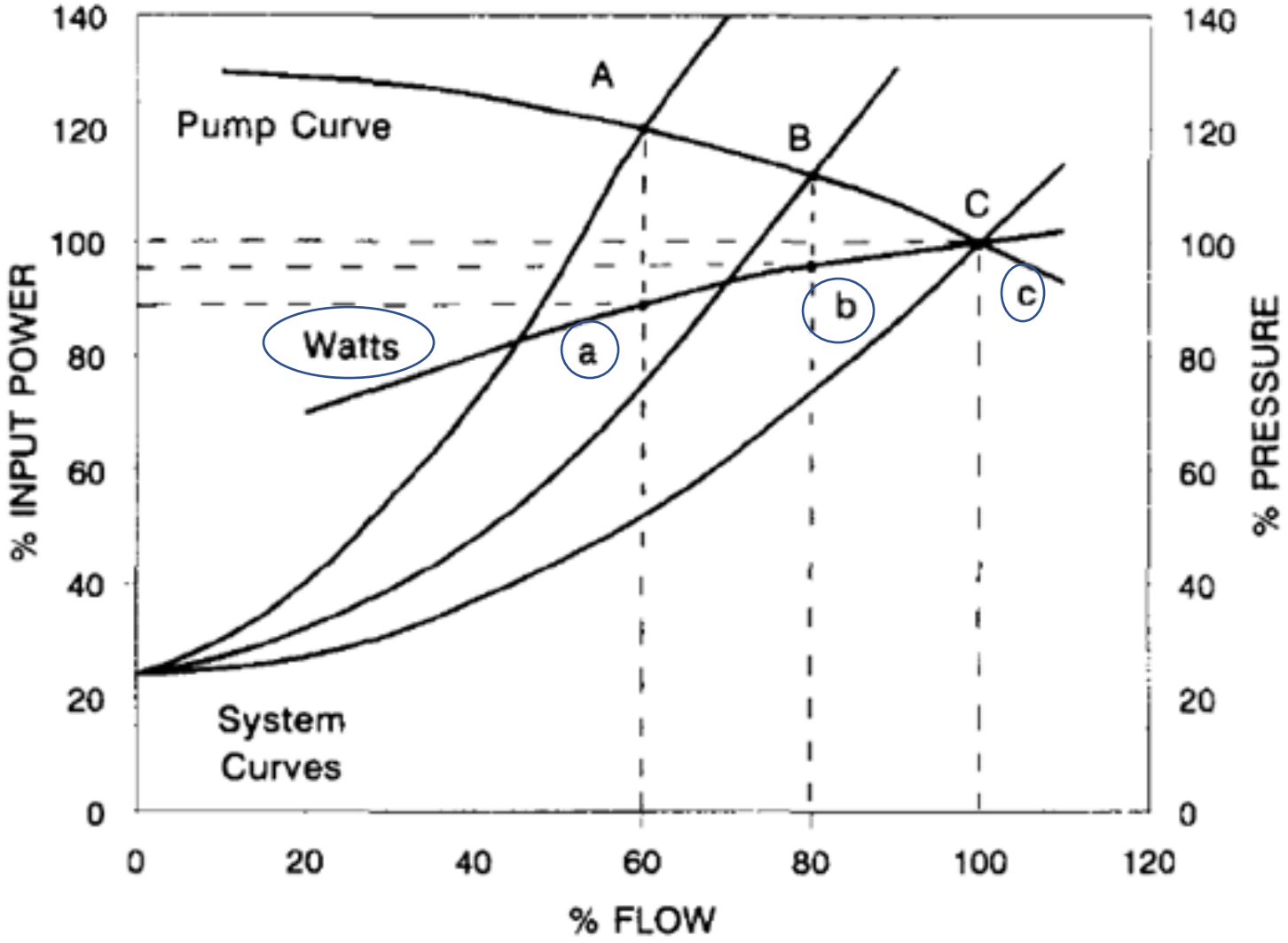
Efficiency vs Energy Savings



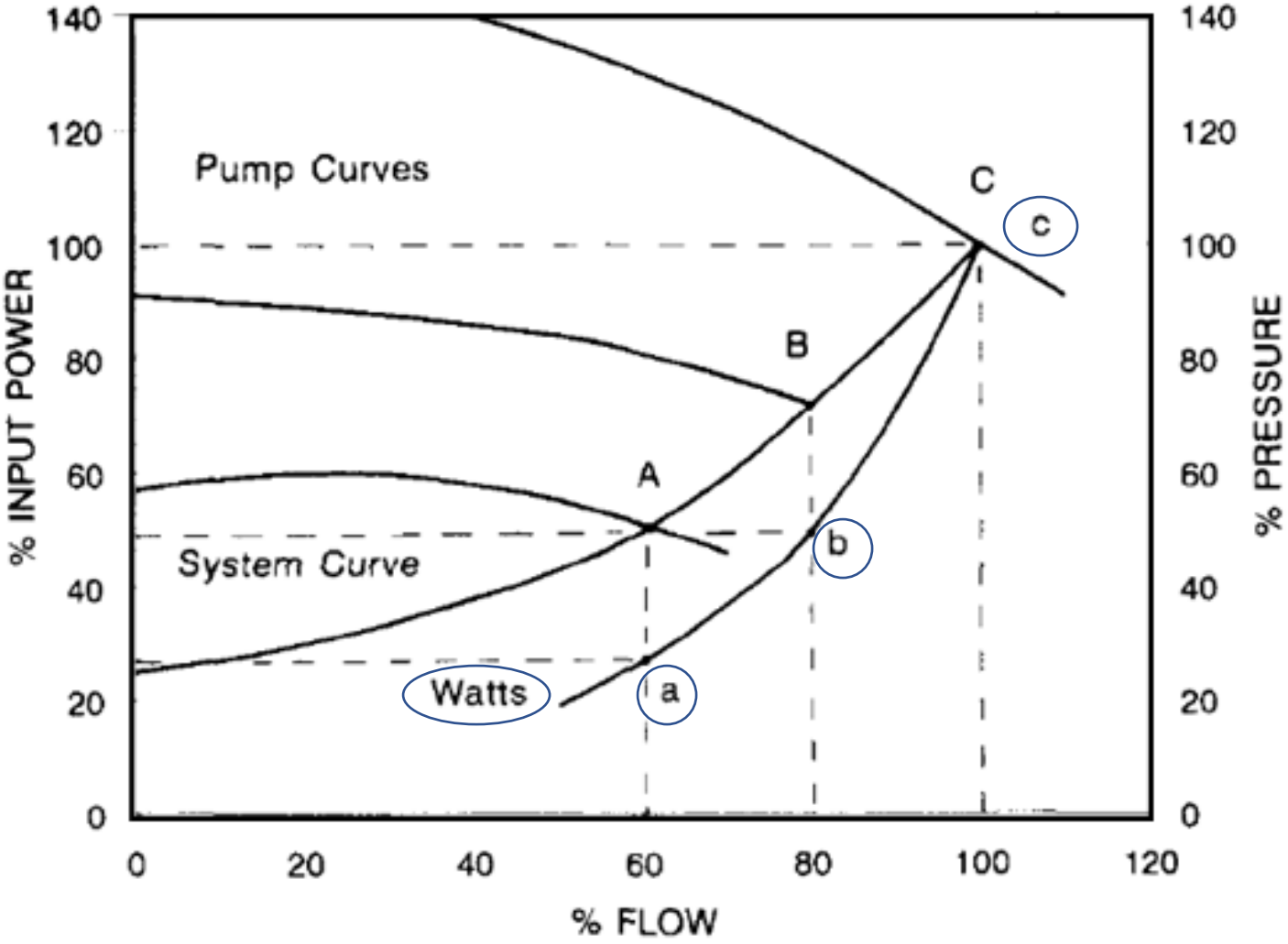


3.45HP variable speed pump motor and control power required at three operating speeds. Input power ranges from over 3000 watts at 3450 rpm to a low of less than 150 at 1200 rpm.

Mechanical Variable Speed average 93% input



Electronic Variable Speed average 53% input



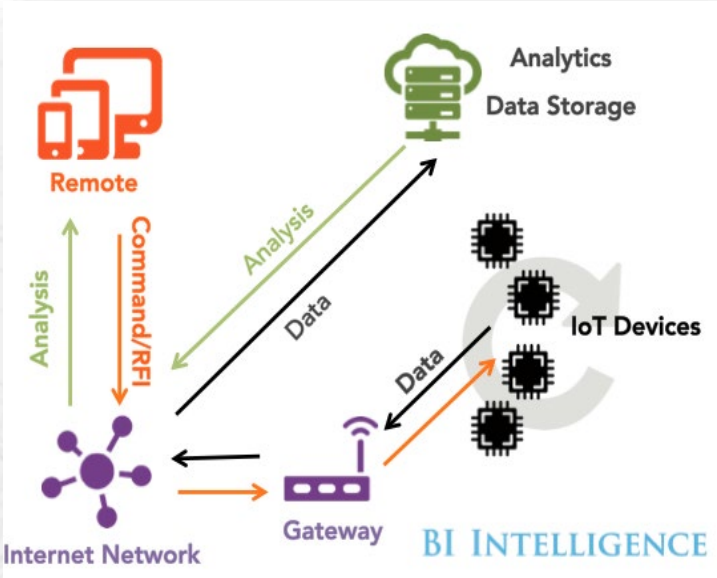
Adding a Power Converter Changes the Game – You knew this!

- **Affinity law**
  - Speed is proportional to the flow while the power is proportional to the cube of the speed.
  - If speed is halved, then the power input is reduced to one-eighth the original power.
- **Eliminate vanes and throttle valve flow controls with 50-70% reduction in energy**

Industrial Internet of Things

How Businesses and End-Users interact with the Physical World

"Industry 4.0" and similar initiatives aimed at increasing operational efficiency and infrastructure performance.



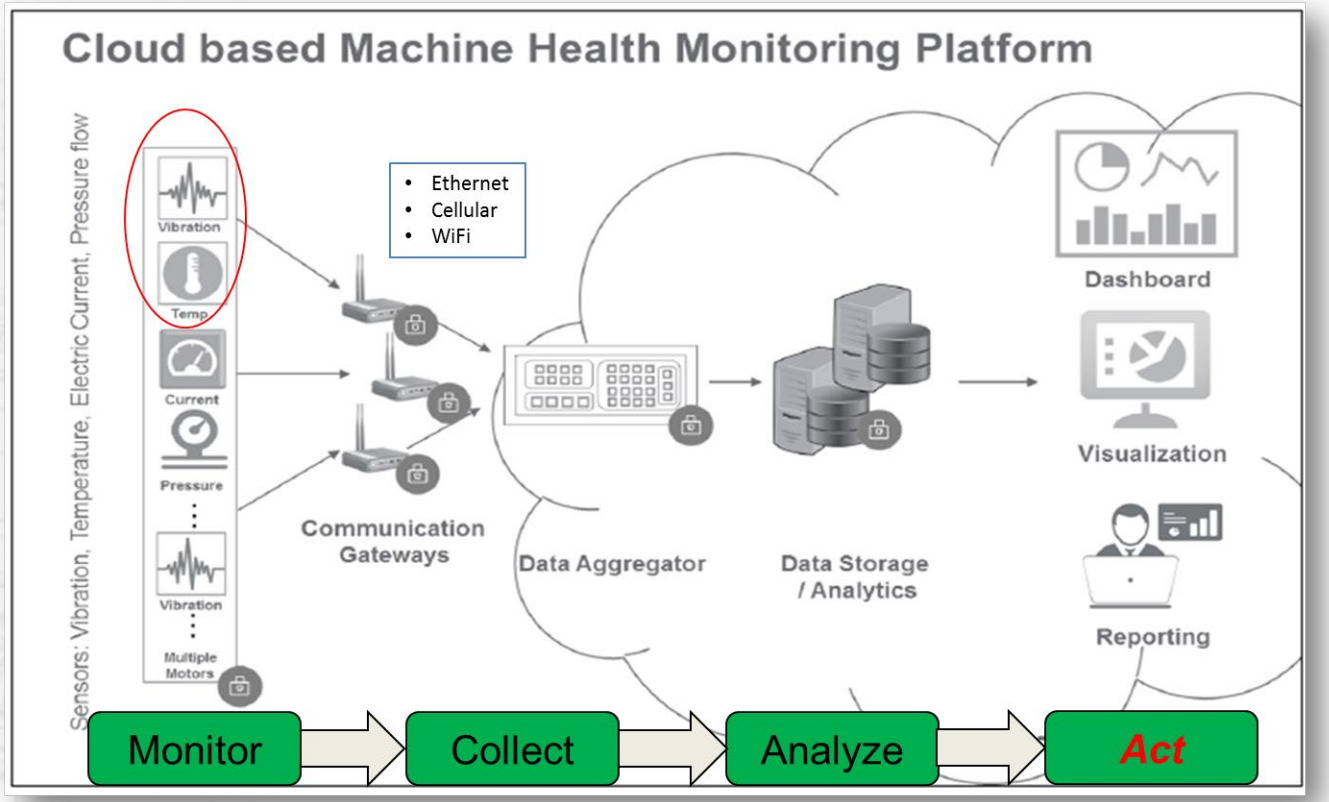
- Value will come not just from sensors collecting data, but from responsive actions of things connected to the Internet

⇨ Users expect access to real-time data at substantially reduced costs, for:

  - Remote monitoring & diagnostics
  - Predictive maintenance
  - Quality control

Remote Asset Condition Monitoring Platform

"Smart Motors" and much more



Easy System setup

- Cloud-based: requires no software installation, updates, backup
- Simple configuration
- Customizable environment and visualization

Minimal Training

- Customizable system setup with immediate deployment
- Intuitive menu navigation
- User friendly information with reports, perf. charts, graphs

Affordable Access

- Data access from anywhere at anytime (downloadable)
- Customizable subscriptions
- Ready to scale (scope, features and functionality)

Use Case - Manufacturing Plant

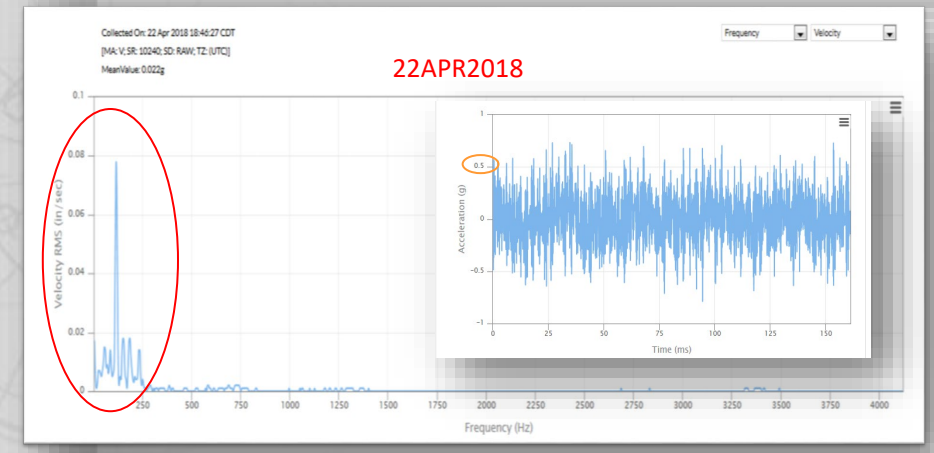
CircPump Bearing failing, measured on MDE – Vibration Spectra (Trending, TWF,FFT)

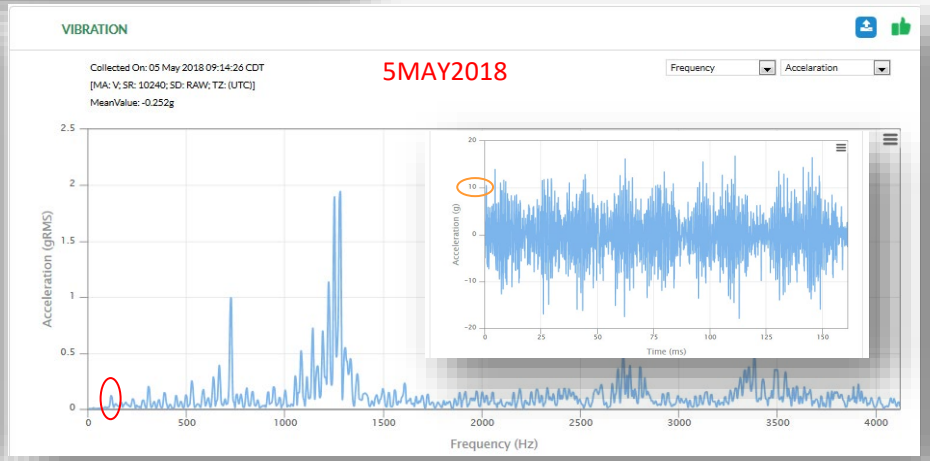
- Correct identification of issue
- Controlled shutdown

→ No production loss

→ No consequential damages

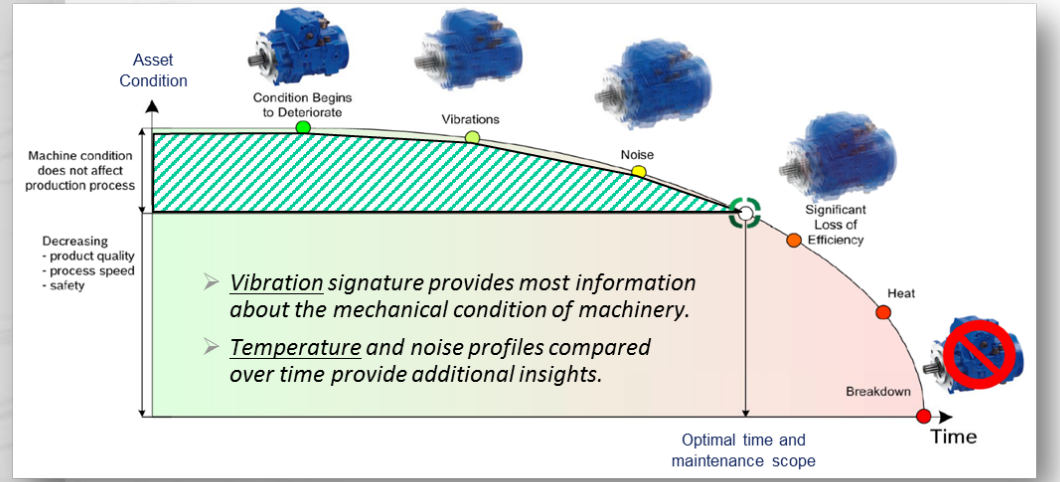
→ Substantial cost avoidance





Factory Maintenance & MRO Field Applications

Remote Diagnostics & Predictive Maintenance



Predict equipment failure before it happens!

- Unexpected equipment failure leads to costly downtime and equipment damages
- ⇨ *Reduce operational costs; maximize the service life of equipment without increasing the risk of failure.*

- Increasing demand for real-time streaming analytics specifically from small and medium enterprises
- ⇨ *Foundation to improve machine reliability is continuous Condition Monitoring.*

Digitization

- Motor coupled with power converter [PDS] power drive system
- PDS becomes an IoT endpoint
- Application conditions provide endless opportunities of control and prediction
- PDS suppliers and system providers create apps to manage
- Energy savings opportunity abound

Questions?

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NEMA
National Electrical Manufacturers Association