



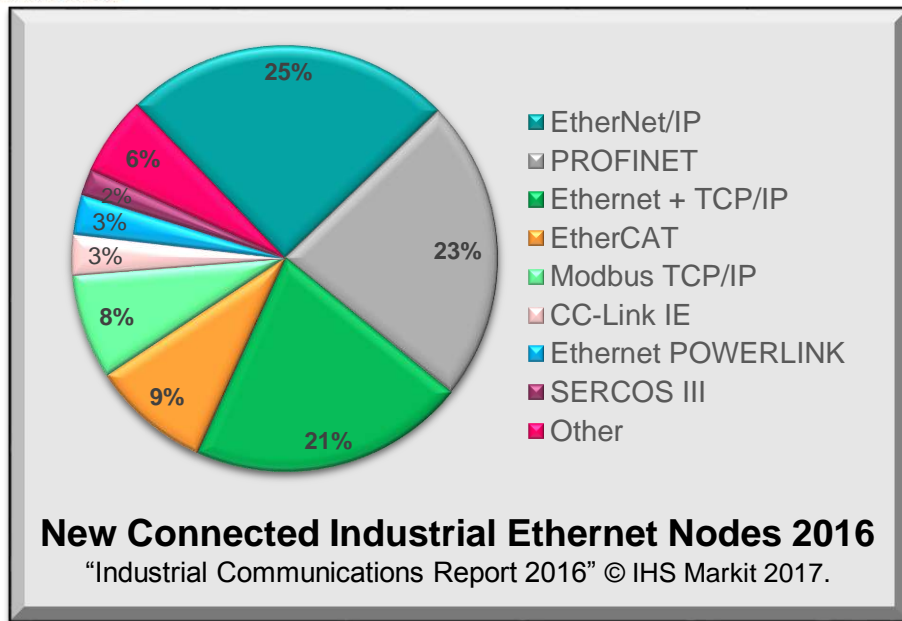
## **Change is Collection of “Processes”**

An Overview of Efforts to Bring EtherNet/IP  
to the Process Industries

**19<sup>th</sup> Annual Meeting of Members  
and Conference General Session**

October 11, 2018

# EtherNet/IP® Leads Adoption of Industrial Ethernet



## *Announcement at SPS IPC Drives 2017:*

*"In 2016, EtherNet/IP maintained its position in the market for industrial Ethernet accounting for 25% of all new Ethernet nodes shipped. Adoption of EtherNet/IP is expected to remain strong as one of the technologies and standards well positioned to benefit from the overall growth in IP-connected devices."*

*Susanne Cumberland, analyst*



**Process Automation & Instrumentation**  
 represents around 1% of installed base of industrial Ethernet.

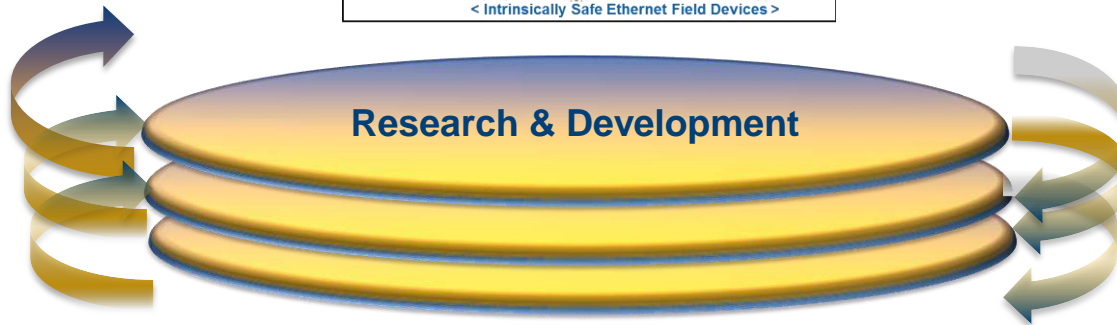
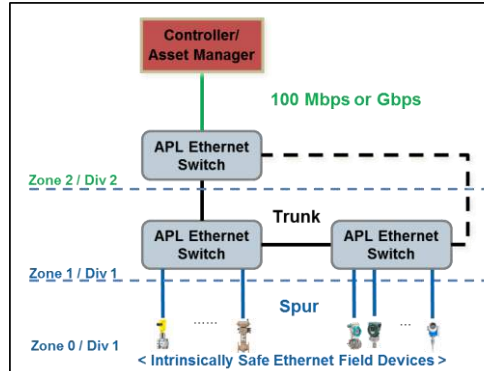


Ethernet is an Enabler for the Namur Open Architecture (NOA), Open Process Automation Forum (OPAF), and Industrie 4.0 and IIOT-related initiatives

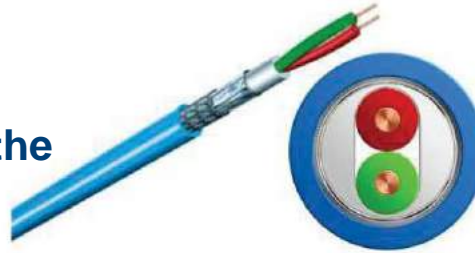


Advanced **Physical Layer**

for Industrial Ethernet



**Single Pair Ethernet PHY for the**



**Automotive & Industrial Sector**

Currently at home in the CG Task Force of IEEE 802.3 Working Group



Advanced Physical  
Layer for  
Ethernet to the Field



FIELD COMM GROUP™  
Connecting the World of  
Process Automation

EtherNet/IP®  
ODVA







Ethernet-based  
Communication System for  
the Process Industry



**ODVA**<sup>TM</sup>

Use Cases  
for Ethernet in  
Industrial Applications



**ODVA**<sup>TM</sup>



Advanced Physical Layer  
for  
Ethernet to the Field



**FIELD COMM GROUP<sup>TM</sup>**  
Connecting the World of  
Process Automation

**EtherNet/IP<sup>TM</sup>**  
**ODVA**







**Enhancements to  
The EtherNet/IP Specification  
for NAMUR's  
NE107 Specification  
for  
Field Device  
Diagnostics**



Maintenance  
Required



Function  
Check

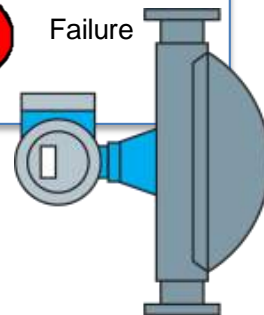


Out of  
Spec



Failure

**Optimization of Technology &  
Standards for Use Cases**



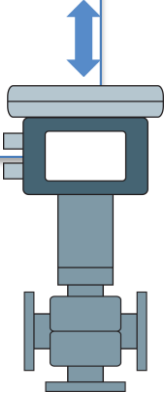


Enhancements to  
The EtherNet/IP Specification  
for Integration of  
FieldComm Group's  
Data Specification  
for HART  
- today's largest installed  
base of field devices

**EtherNet/IP™**



**HART**  
COMMUNICATION PROTOCOL



Optimization of Technology &  
Standards for Use Cases





Welcome ODVA's Newest Principal Member

**Honeywell**  
THE POWER OF **CONNECTED**



# System Suppliers on the Move in ODVA

**Honeywell Process Solutions**

Brian Reynolds

Senior Director of Engineering Projects and Automation



# Honeywell Overview

NYSE: **HON** | ~1,300 sites | ~131,000 employees | Morris Plains, N.J. headquarters | Fortune 100

## Aerospace



**\$14.8B**  
Sales

Our products are used on virtually every commercial and defense aircraft platform and in more than 100 million vehicles worldwide and include aircraft propulsion, cockpit systems, and satellite communications.

## Home and Building Technologies



**\$9.8B**  
Sales

Our products, software, and technologies are in more than 150 million homes and 10 million buildings worldwide, helping customers control their comfort, security, and energy use.

## Performance Materials and Technologies



**\$10.3B**  
Sales

We develop advanced materials, process technologies, automation solutions, and industrial software that are revolutionizing industries around the world.

## Safety and Productivity Solutions



**\$5.6B**  
Sales

We improve enterprise performance and worker safety and productivity with our scanning and mobile computers, software, warehouse automation solutions, and personal protective equipment.

## Aligned to Key Global Macro Trends

Reflects 2017 Full Year Results



# Honeywell Process Solutions



> 10,000 installations  
in more than 125  
countries around the  
world



**13,000** Employees

- **24** Factories Worldwide
- **200+** Local Offices
- > **90** Local Service Centers Worldwide
- > **2,000** Service Technicians

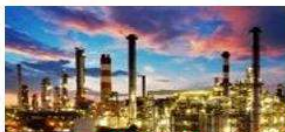
## Strengths

- 40-plus year leader in automation
- Safety, reliability, security built into technology **platforms**
- Continuous evolution approach to maintain **asset lifecycle**
- Revolutionary approach to **lower risk** project execution
- Outcome-based solutions to optimize assets and **productivity**
- Smart and **connected** field instrumentation
- Global expertise and local service



**Honeywell**  
THE POWER OF **CONNECTED**

# Serving Process Industries



**Refining &  
Petrochemical**



**Pharmaceuticals**



**Oil & Gas**



**Chemicals**

Our solutions are installed  
at more than

**10,000 sites**

around the world



**Power Generation**



**Minerals, Metals  
& Mining**

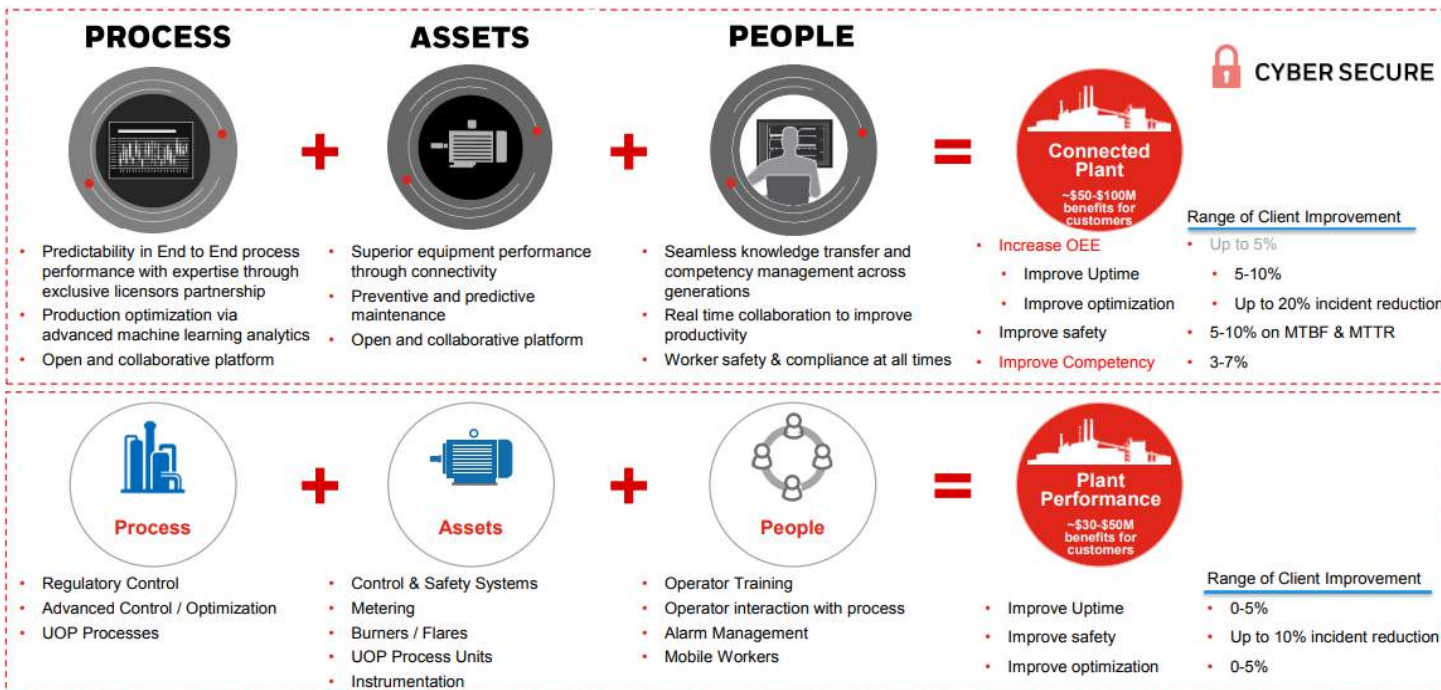


**Midstream Gas**



**Pulp & Paper**

# Honeywell Connected Plant



# Honeywell Products that integrate ODVA Technology



**ControlEdge™ UOC**  
Unit Operations Controller



**ControlEdge™ PLC**



**C300 Controller**



**ControlEdge™ vUOC**  
Virtual Unit Operations Controller

ODVA Technology	Date
EtherNet/IP	2014
DeviceNet	2003
ControlNet	1997



**C200 Controller**

***Over 20 years of experience with ODVA technology and standards using CIP***

# Experion System with EtherNet/IP

**Honeywell Advanced Applications**  
Improve operators, operations, and the bottom line

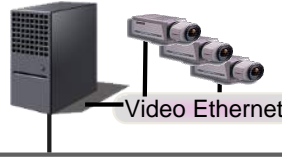
**Experion Station**  
*Remote Operations*

**Digital Video Manager**  
*Video as Process Sensor*

**Uniformance PHD**  
*Enterprise Historian*

**eServer**  
*Web Server*

**FDM**  
*Asset Management System*



**Advanced Applications Network**

**Orion Console**  
*ASM Operator Effectiveness*

**Redundant Servers**  
*Global Database, History*

**Direct (Opr.) Station**

**Flex/ Engg. Station**

**Simulation Node**  
**SIM C300**

**Fault Tolerant Ethernet (FTE)**



**Supervisory Control Network**

**Honeywell One Wireless Suite**

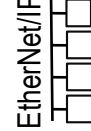


**C300**



**EIM**

**Series C**



**EtherNet/IP**  
**ControlEdge PLC**



**EtherNet/IP**  
**ControlEdge UOC**



**EtherNet/IP**  
**ControlEdge vUOC**





## Importance of EtherNet/IP to HPS

- The use of Ethernet based I/O networks for automation applications has been steadily trending up over the past decade.
- Ethernet based I/O networks and smart I/O devices have become a common requirement for most all Greenfield and Large Revamp projects.
- EtherNet/IP is a well defined, mature, and open industrial protocol that provides a comprehensive set of data messages and services. It is equally applicable to both factory and process automation in both continuous and batch operations.
- EtherNet/IP is preferred by a large percentage of our customers. Our support for EtherNet/IP enables the user to utilize their vendor of choice.
- EtherNet/IP supports Honeywell Connected Plant by providing a way to collect more meaningful data from devices improving overall equipment effectiveness (OEE) and safety.

## Importance of ODVA to HPS

- Industry 4.0, IIoT, and the concept of Edge Analytics are driving the message that users can improve all aspects of their process, people, and the bottom line, using valuable data resident in devices located close to the process. ODVA helps Honeywell encapsulates these themes under our **Connected Plant** initiative.
- **Interoperability** allows the user to safely interconnect different (conformant) device types, from a multitude of vendors, on the same EtherNet/IP network. ODVA and EtherNet/IP ensures that all data is accessible and all devices interoperate in a safe and predictable manner.
- ODVA ensures device Interoperability through.....
  - Strong specifications and well defined device behaviors
  - Mandatory and comprehensive conformance testing
  - EDS technology
- ODVA and Interoperability enables Honeywell to provide solutions that unlock all of the value provided by EtherNet/IP. ODVA also ensures that EtherNet/IP will grow as the technology grows.



# EtherNet/IP® Under the Looking Glass

**E.I. DuPont de Nemours and Company**  
Dave Bell  
Senior Control Systems Engineer



About DuPont

DuPont and Honeywell

About the Application

Lessons Learned

View to the Future

Founded in 1802 by Éleuthère Irénée duPont

Originally a gunpowder manufacturer

Invented nylon, Dacron<sup>®</sup>, Orlon<sup>®</sup>,  
Teflon<sup>®</sup>, Freon<sup>®</sup>, Kapton<sup>®</sup>, Mylar<sup>®</sup>,  
Corian<sup>®</sup>, Tyvek<sup>®</sup>, Nomex<sup>®</sup>, Kevlar<sup>®</sup>  
among many others

60,000 employees in 90 countries



**Our Purpose**

**DuPont is a Science Company**

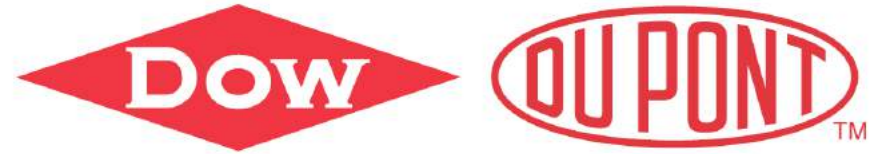
We work collaboratively to find sustainable, innovative, market-driven solutions to solve some of the world's biggest challenges, making lives better, safer, and healthier for people everywhere.

10-06-14 © National Geographic Image DuPont Today 2014 2

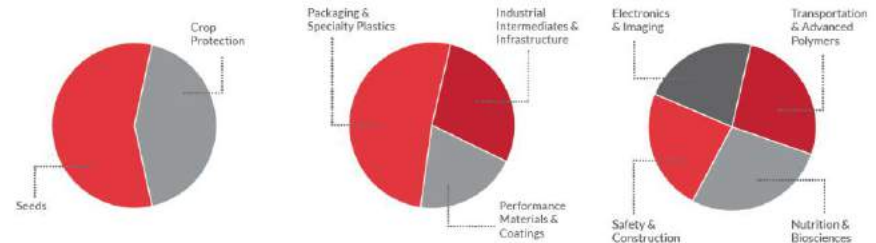
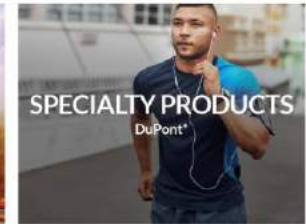
DuPont merged with Dow Chemical in 2014

Created three segments, in preparation for split into three separate companies (2019)

- Agriculture (Corteva)
- Materials Science (Dow)
- Specialty Products (DuPont)



**THREE INDUSTRY-LEADING COMPETITORS WITH STRONG FOUNDATIONS  
FOR INDEPENDENT, SUSTAINABLE GROWTH**



## Specialty Products Division



### Electronics & Imaging

*Circuit & Industrial  
Technologies*

*Photovoltaics and  
Advanced Materials*

*Advanced  
Printing*

*Semiconductor  
Technologies*

*Display  
Technologies*



### Safety & Construction

*Kevlar®  
and Nomex®*

*Tyvek®  
and Typar®*

*Corian® Design*

*Performance  
Building Solutions*

*Water Solutions*

*Sustainable  
Solutions  
(for reporting purposes)*



### Transportation & Advanced Polymers

*Performance  
Resins*

*Performance  
Solutions*

*Nylon Enterprise  
& Polyester*



### Nutrition & Biosciences

#### Nutrition & Health

*Probiotics,  
Cultures &  
Food Protection*

*Pharma  
Excipients*

*Emulsifiers  
& Sweeteners*

*Protein Solutions*

*Systems  
& Texturants*

#### Industrial Biosciences

*Advanced Biofuels*

*Biomaterials*

*Bioactives*

*Microbial Control*

*Clean Technologies*

## Safety & Construction

### At A Glance

#### Core Market Segments



#### Category Leading Brands



**~7,000**  
Colleagues



**>10,000**  
Customers  
Globally



**#1 or #2**  
Share in In-kind  
Core Segments



**19**  
R&D  
Centers



**>1,000**  
Products Launched  
in 2017



**>18,000**  
SKU's



**42**  
Manufacturing  
Sites



## Spruance Works Facility

- Located just outside Richmond, Virginia
- Opened in 1929 to produce Rayon
- Headquarters for Safety & Construction business
- Largest site in DuPont with approximately 2500 employees



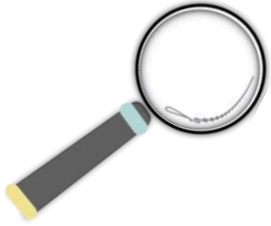
## DuPont – Honeywell Alliance

DuPont has developed a list of approved suppliers

- DCS – Honeywell and Siemens
- PLC – Rockwell and Siemens

DuPont holds a seat on several Honeywell committees

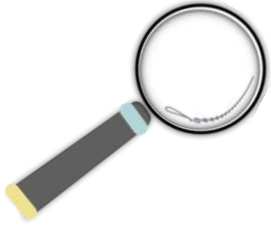
- Experion PKS Customer Advisory Board
- User Input Subcommittee
- User Group Steering Committee
- Quality Control System Forum
- Abnormal Situation Management Consortium



## Started Small!

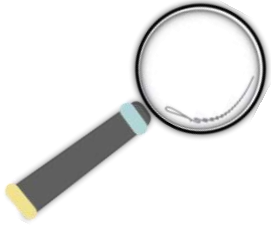
- Needed to interface to existing Honeywell Experion<sup>®</sup> PKS distributed control system (DCS)
  - In same building as existing operations
  - Concerns about “protection to operations” and personnel exposure.
  - Needed a way to keep electricians in immediate area of new equipment
  - Consequence of failure of new technologies was low because test facility.
  
- Success (or not) would dictate feasibility of commercial implementation in the future





## Experience with Various Networks

- In general, DuPont has been slow to implement process control via networked devices, preferring old-school method of “home-run” cables back to controllers and I/O located centralized Instrument Control Rooms.
  - Safety and reliability are of highest priority because of engrained history, and hazardous chemicals and processes.
  - Many facilities are over 30 years old, and networking use was not as common.
  - Risk of production loss if new technology fails to perform.
  - Important to keep controller to controlled device connection simple & short.



## Experience with Various Networks

- Profibus used primarily for single device communication
  - Isolated cases where Profibus was only network option available from the vendors
  - Complex setup and configuration
  - Difficult to add or modify networked components, including temporary communication loss when downloading
- ControlNet used primarily for Rockwell PLC and Drive communications
  - 5000' between devices
  - Robust and easy to implement within Rockwell PLCs
  - Complex interface into Honeywell control system, requiring PLC code modifications, packing data into custom arrays for data exchange
- DeviceNet used sporadically
  - Robust “sensor” network
  - Complex interface into Honeywell control system, using data exchange blocks and specific network configuration, with communication loss when adding devices

## About the Application

Approximately 200' from DCS to project area.

Multiple active operations.

Varying ceiling / roof heights.

No existing cable tray.



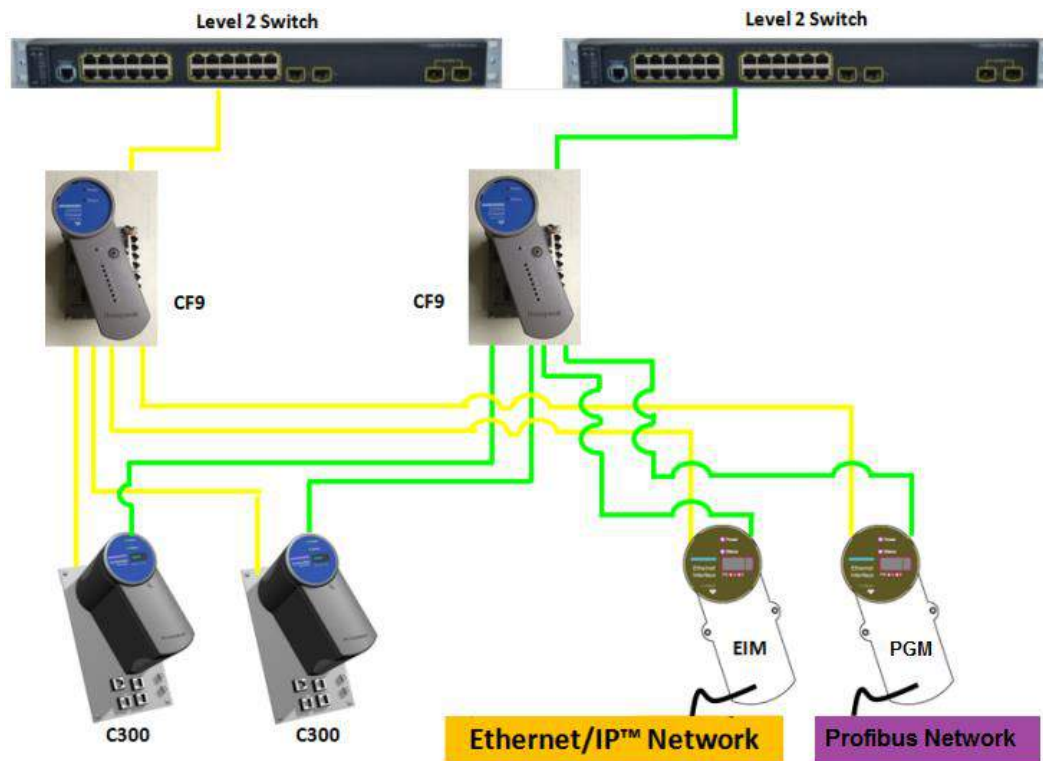
## About the Application

Implemented both EtherNet/IP and Profibus

- Newly released EIM unproven
- Hands-on experience with Profibus

Honeywell interface modules designed to connect close to controller

Redundancy options available but not implemented



New equipment being installed consisted of:

- Vendor skid with Rockwell CompactLogix PLC
- Pumps, blowers, other motors, some constant speed, some variable speed
- Temperature, Pressure, Flow instrumentation

Experion compatible remote solutions limited to Profibus and DeviceNet.

- Turck ExCom IO via Profibus (strong reputation, unused in DuPont)
- Experion Universal Process Cabinet (expensive, fiber optic interconnection)
- DeviceNet for VSD and motor starter interface (vendor reluctance, complex)
- Experion Ethernet Interface Module (EIM) being introduced, but untested.

### Turck ExCom

- Worked as designed and intended
- Profibus interface a bit of a challenge to implement and modify
  - Once configured, smooth integration into Experion® control modules
  - Changing configuration (adding or changing module types) proved difficult and resulted in temporary communication loss
- EtherNet/IP interface not available from Turck
- EtherNet/IP interface to Honeywell not commercially available





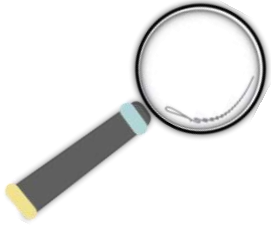
## About the Application

### Honeywell Experion® Ethernet Interface Module

- EtherNet/IP based communication
  - Module resides in same cabinet as controller
- Developed backup plan of hardwired connections
  - Honeywell identified a defect and temporarily halted production
- Seamless integration into Experion control modules
  - Rockwell PowerFlex 753 Variable Speed Drive
  - Rockwell PowerFlex 525 Variable Speed Drive
  - Rockwell E300 Electronic Overload Relay
  - Rockwell CompactLogix PLC



## About the Application



### **On Time!**

- Use of EIM reduced labor hours 80% for motor, drive, & PLC interfaces

### **On Budget!**

- Use of EIM reduced wiring cost 50% for motor, drive, & PLC interfaces

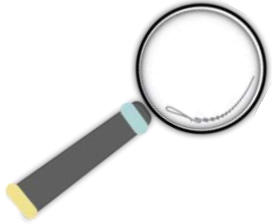
***Eleven Months and Counting!***





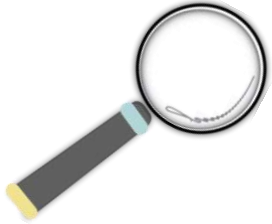
**The key strength of EtherNet/IP is in its ability to pull multiple pieces of data from a given device, avoiding multiple cable pulls and I/O consumption, and giving a more complete picture of the status and operation of the device.**

The EtherNet/IP logo, featuring the word "EtherNet/IP" in a bold, blue, sans-serif font. The "N" is stylized with a yellow diagonal bar through it. A registered trademark symbol (®) is located at the top right of the "P".



## Experience with Products from ODVA Members

- Honeywell Experion® Ethernet Interface Module has performed well.
  - Intuitive and straightforward setup and configuration.
  - EtherNet/IP based devices integrated to date have gone smoothly.
  - Anxious for Honeywell to add to supported EtherNet/IP devices.
  - Strongly recommend for future projects.
- Turck ExCom has performed well, but due to complex Profibus setup will not be recommended for future projects.
  - Turck has developed an EtherNet/IP interface, which will be evaluated in 2019.



## Experience with Products from ODVA Members

- Endress+Hauser Promass flowmeter
  - Smooth integration into Rockwell PLC – Detailed EDS file!
- Acrison SBC-2000 Feeder
  - Smooth integration into Rockwell PLC – Detailed EDS file!
- Red Lion N-Tron, Rockwell Stratix, Cisco Catalyst, and Phoenix Contact Ethernet switches have all performed well and will continue to be used.
- Advantech Adam Serial Modbus IO modules successfully evaluated in separate small scale test. Will evaluate EtherNet/IP in 2019.
- Rice Lake Weighing Systems EtherNet/IP based scales successfully used in commercial facility for years



- Plans to evaluate EtherNet/IP devices and applicability
  - Honeywell ControlEdge Unit Operations Controller
  - Rockwell Automation ArmorPoint and ArmorBlock IO modules
  - Other EtherNet/IP based devices (IIOT)
  - Device Level Ring topology
- EtherNet/IP devices that do not come with full and complete EDS files will not be evaluated!
- Currently in design phase of \$130M capital project
  - Squeezed into existing manufacturing facility
  - Multiple interconnected unit operations islands
  - Remote, distributed IO required to reduce current operations risk
  - Installation and configuration are both time constrained



# EtherNet/IP®

*Capabilities and ease of implementation make it  
the network of choice for future projects.*

*Dave Bell, E. I. DuPont de Nemours and Company*



**THANK YOU**