

The logo for NHP, consisting of the letters 'N', 'H', and 'P' in a bold, white, sans-serif font. The 'N' and 'P' have a distinctive shape with a vertical bar in the middle of their stems. The logo is set against a solid blue background.

**NHP**

WEA Conference

# Scalable Analytics

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12<sup>th</sup> September 2019

## ANALYTICS

The discovery, interpretation and communication of meaningful patterns in data. Analytics relies on the application of statistics, computer programming and operations research to quantify performance.



## LOOKING AT TODAY

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FactoryTalk LogixAI

FactoryTalk Analytics for Devices

Utilizing IIoT 4.0 & Smart Devices

Today's demonstration includes;

ControlLogix Controllers

CompactLogix Controllers

PowerFlex Drives

Stratix Switches

Etap



# Analytics by type

← *Basic Analytics* →

← *Advanced Analytics* →

Human Decision Making

**DESCRIPTIVE**  
Historical Data

**DIAGNOSTICS**  
Historical

**PREDICTIVE**  
Future

**PRESCRIPTIVE**  
Future Action

WHAT HAPPENED?

WHY DID IT HAPPEN?

WHAT IS ABOUT TO HAPPEN?

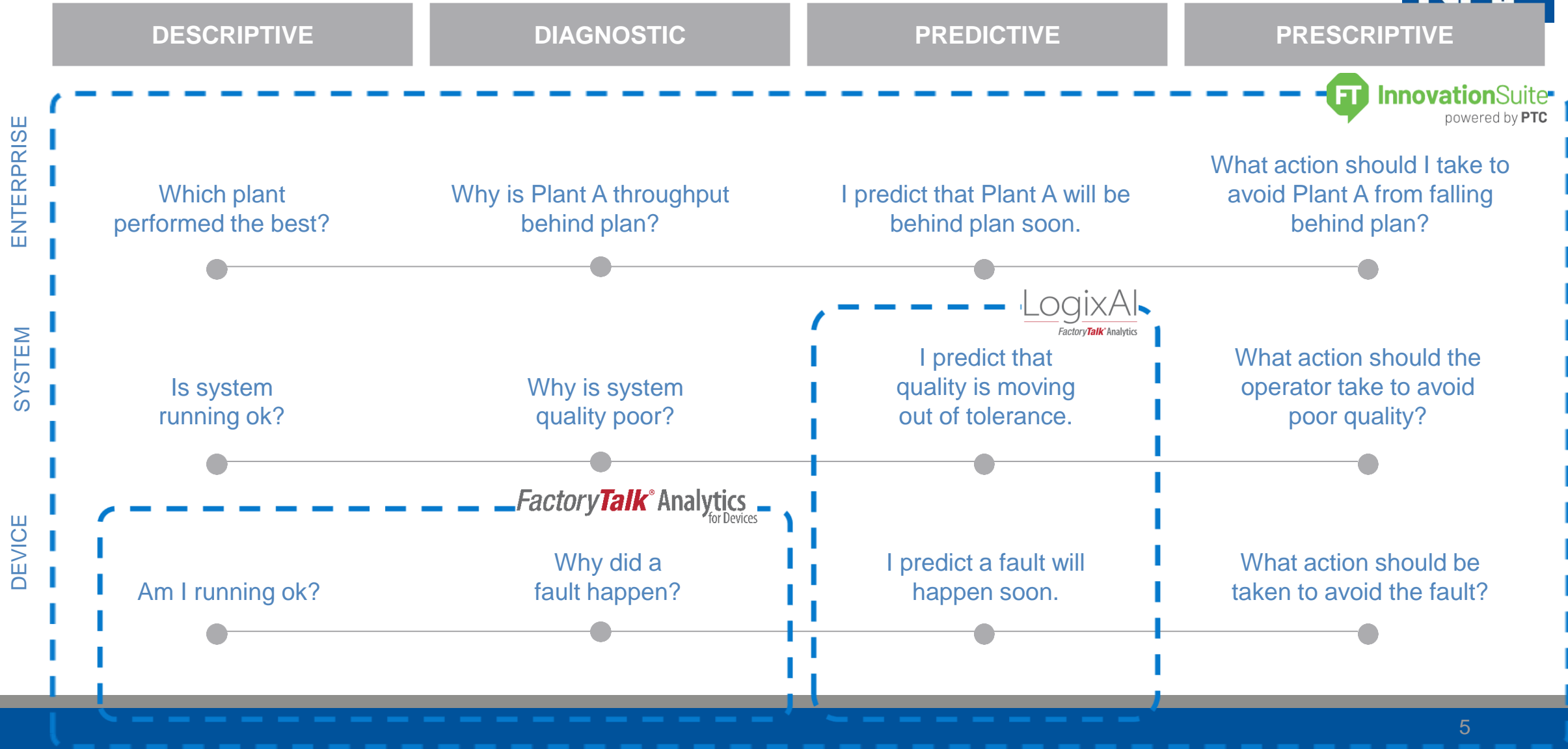
WHAT CAN I DO TO AVOID IT?



# Scalable Analytics

Rockwell Automation® approach for manufacturing operations

NHP



# FactoryTalk<sup>®</sup> Analytics for Devices<sup>™</sup>

Descriptive | Diagnostic | Predictive | Prescriptive



# FactoryTalk<sup>®</sup> Analytics for Devices





**DETECT**  
your smart devices, automatically



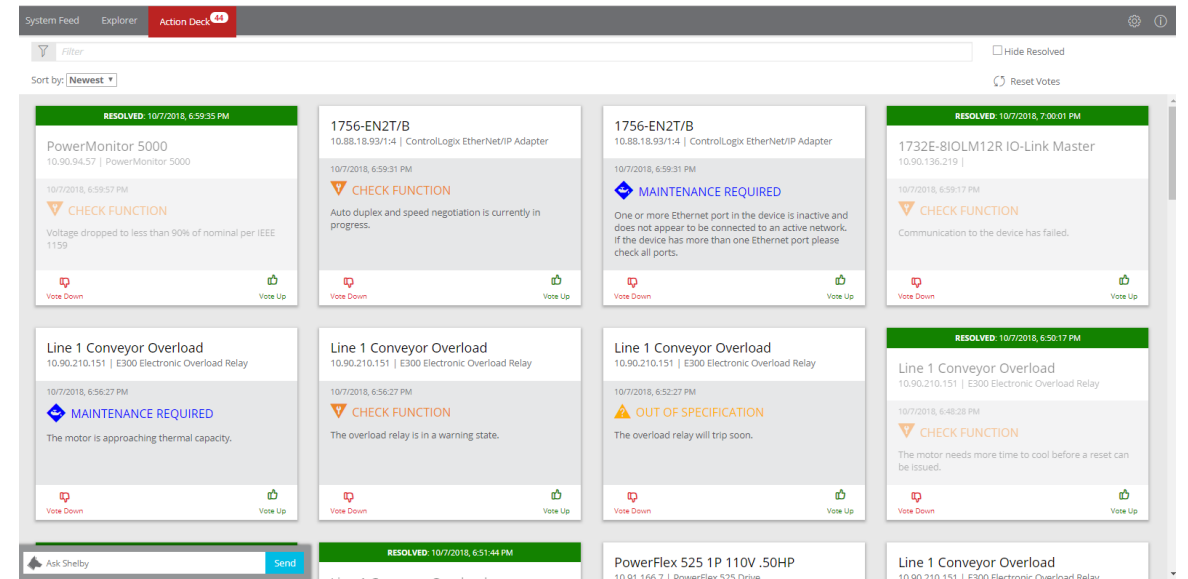
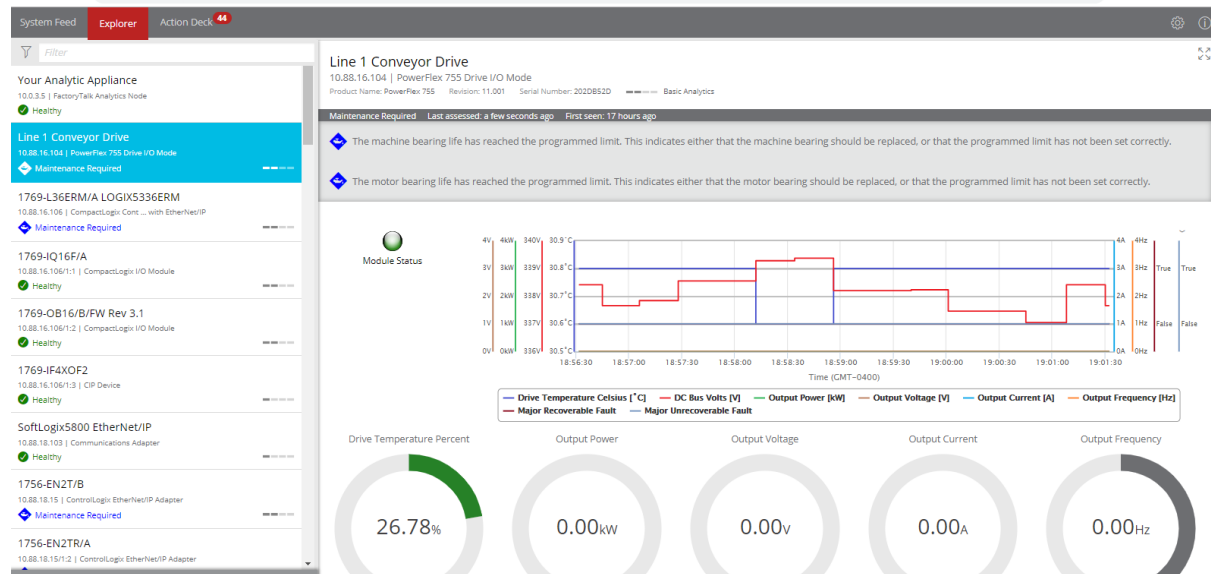
**DIGITIZE** the data, allowing work to be done



**ANALYZE** the data perform calculations, transform the data



**ACT** on information, get to the right people, on the right device





## FactoryTalk Analytics for Devices DEMO

# Embedded Predictive Analytics

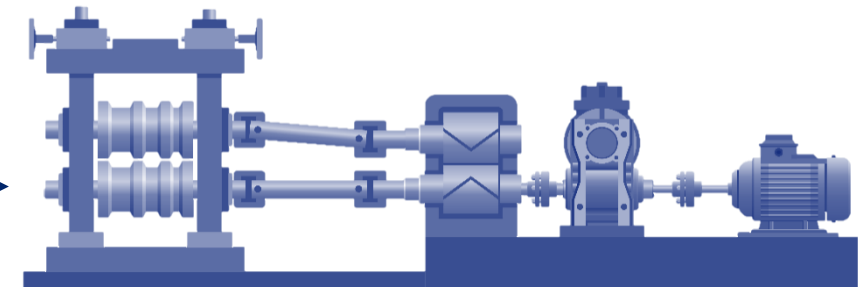
FactoryTalk® Analytics™ LogixAI™

LogixAI  
FactoryTalk Analytics

NHP

The user defines the desired output to be predicted

The user also defines the possible inputs that could impact the output being monitored



The module finds model parameters  
The functional dependency  
Causally relevant inputs

User friendly – Production/Engineering focused

# FactoryTalk<sup>®</sup> Analytics<sup>™</sup> LogixAI<sup>™</sup>

Descriptive | Diagnostic | **Predictive** | Prescriptive



# How Does FactoryTalk<sup>®</sup> Analytics<sup>™</sup> LogixAI<sup>™</sup> Work ?

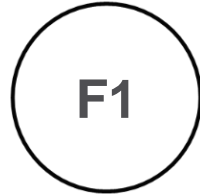
Descriptive | Diagnostic | **Predictive** | Prescriptive



The screenshot shows the '1. Define Prediction' step of a four-step process. The steps are: 1. Define Prediction (active), 2. Assign Tags, 3. Review, and 4. Finish. The 'Define Prediction' section includes the following fields and options:

- Select prediction creation method:**  Create new prediction,  Add new prediction to existing model
- Select the process you want to model:** Four icons are shown: Boiler, Generator, Pump (selected), and Advanced.
- Enter pump name:** myPump
- Select the controller slot:** 1
- Select prediction type:**  Cavitation,  Blockage,  Other (requires advanced tag assignment)
- Enter prediction name:** Cavitation5
- Enter prediction description (optional):** Predicting cavitation for the line 1 pump—version 5.

At the bottom of the form, there is a blue button labeled 'CONTINUE TO ASSIGN TAGS' with a right-pointing arrow, and a 'Cancel' link below it.



Select **controller output(s)** you care about

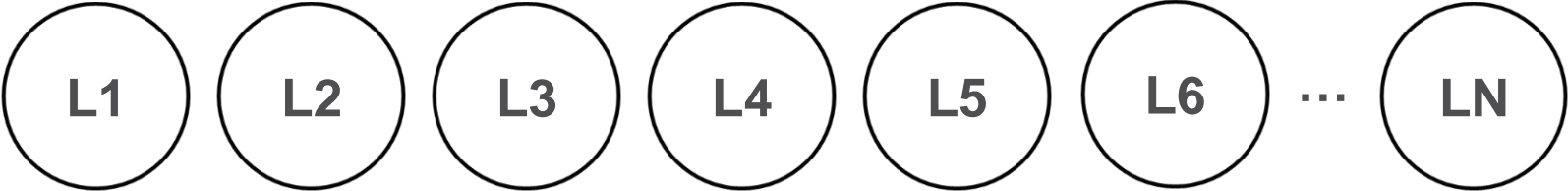
# How Does FactoryTalk® Analytics™ LogixAI™ Work ?

Descriptive | Diagnostic | **Predictive** | Prescriptive



F1

Select potential **inputs or variables** from controller tags

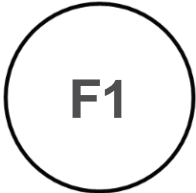


# How Does FactoryTalk® Analytics™ LogixAI™ Work ?

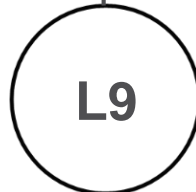
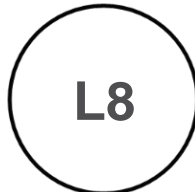
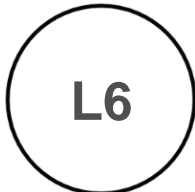
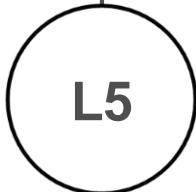
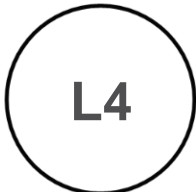
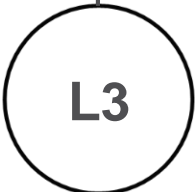
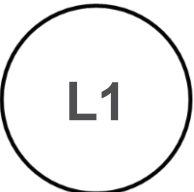
Descriptive | Diagnostic | **Predictive** | Prescriptive



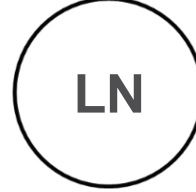
Type	Process Variable
Output	Power
Input	Flow
Input	Pressure



FactoryTalk® Analytics™  
LogixAI™ determines  
inputs that relate to  
your output

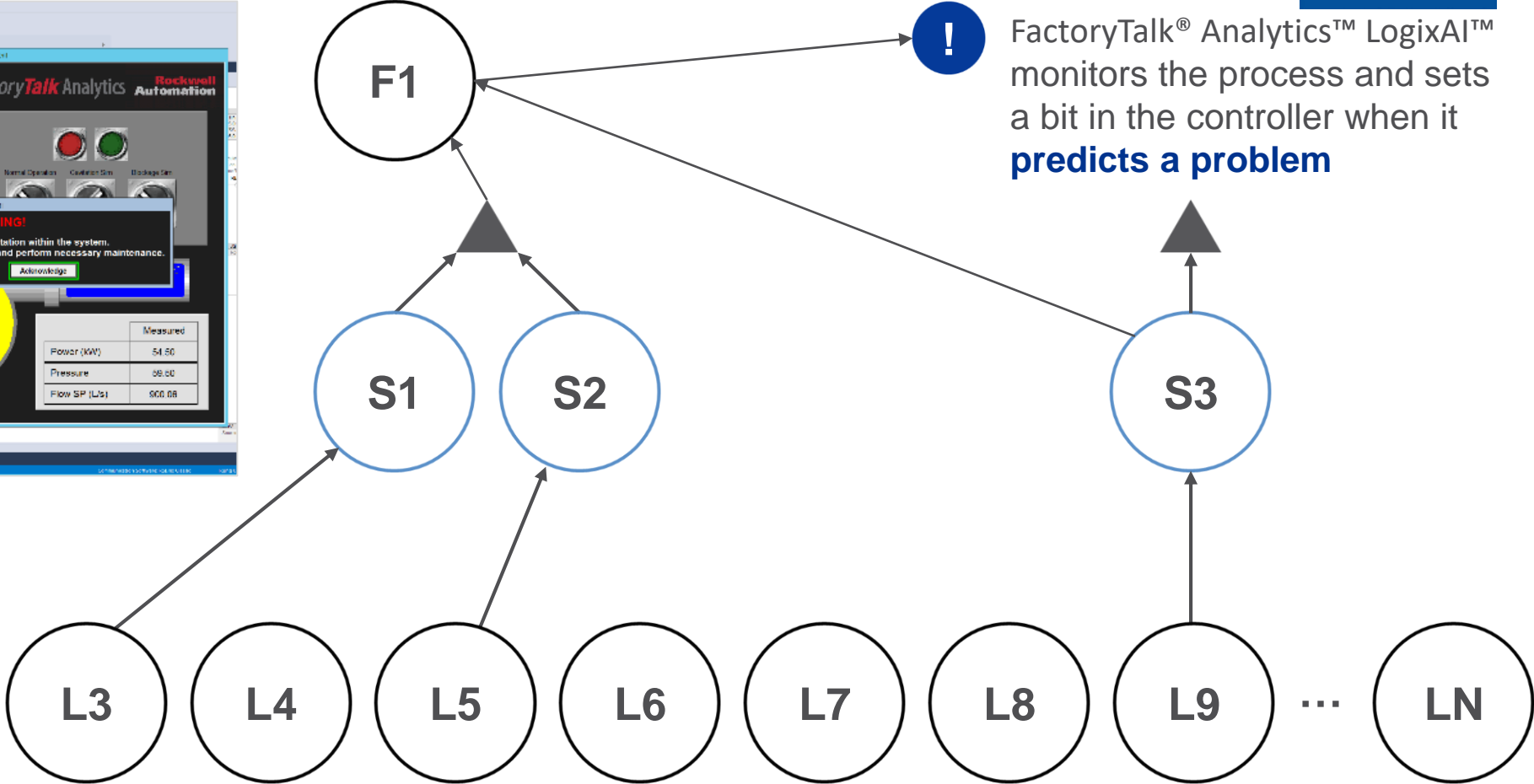
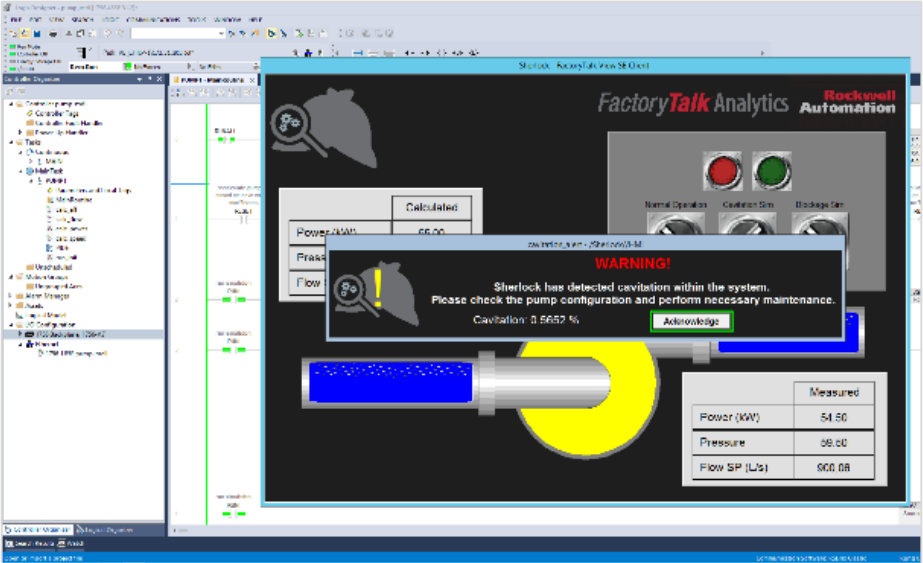


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# How Does FactoryTalk® Analytics™ LogixAI™ Work ?

Descriptive | Diagnostic | **Predictive** | Prescriptive



# FactoryTalk<sup>®</sup> Analytics<sup>™</sup> LogixAI<sup>™</sup> Models of Operation



## Anomaly Detection

Learn what's normal, find deviations from normal.

Anomalous behavior that is not understood and cannot be alarmed upon through typical automation system capabilities can cause scrap, defects, poor quality or undesirable operations.

A predictive model can be utilized to support understanding if an output variable could exceed acceptable operational boundaries.

Pinpointing slow changing deviations that cannot be detected by other means enables proactive thinking to address conditions before production is impacted.

## Virtual Sensor

Estimate values from incomplete data.

A predictive model can act as a virtual sensor (aka soft sensor) by estimating output values.

Having a predicted, estimated output value reduces the need for manual effort required to capture and record readings.

A virtual sensor can:

- reduce the need to instrument the operation with expensive or difficult to implement instruments or sensors.
- check the reliability of a physical sensing device where environmental conditions may cause degradation of the physical sensor reading ability (i.e. caused by heat, humidity, debris).
- enable tight control or proactive deployment of resources when the estimated output variable is expected to reach an out-of-specification condition.

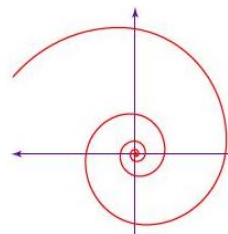
# Basic approach to modeling

Automated modeling example

$$r = ae^{\theta \cot b}$$

- Data modeling is different than object modeling
- LogixAI models operational behavior by creating a mathematical equation
- Other algorithms may build models based upon clusters, regression, etc.
- Applications that follow the laws of physics can be modeled by LogixAI
  - Example: winder applications

A spiral is a plane curve that, in general, winds around a point while moving ever farther from the point.



LogixAI  
FactoryTalk Analytics

NHP





## FactoryTalk LogixAI DEMO

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*FactoryTalk*<sup>®</sup> Analytics  
for Devices

LogixAI  
*FactoryTalk*<sup>®</sup> Analytics

Thank you