



WORLD CLASS MAINTENANCE

Condition-Based Maintenance (CBM)

Just right, just in time



Agenda



1) Maintenance Options



2) PI System: A Framework for CBM + *cookbook*



3) Open discussion

Many words for similar goal:

Keep assets healthy



...In a cost effective way



Schedule-based maintenance
is one of the **easiest** methods

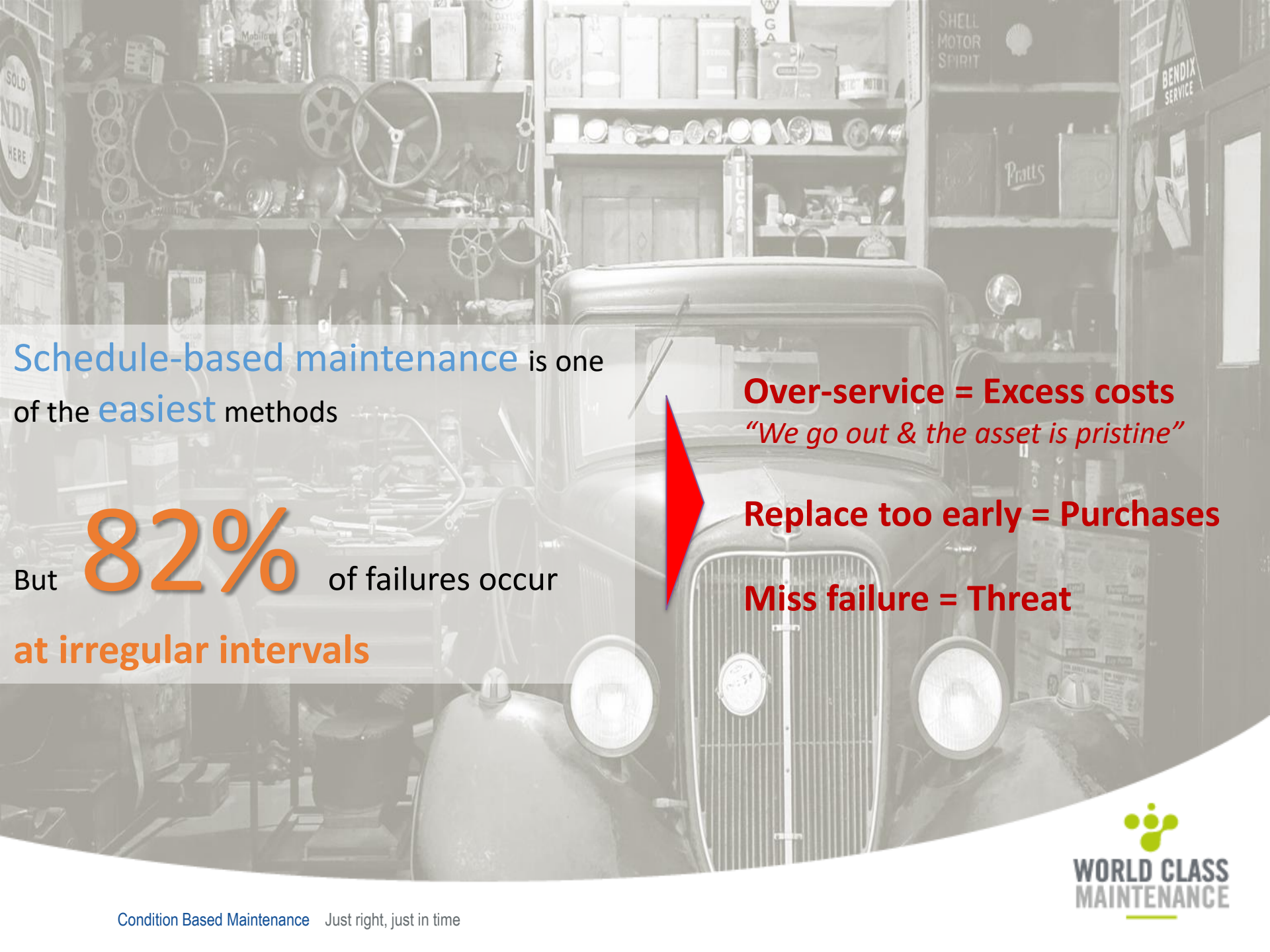
But **82%** of failures
occur
at irregular intervals

Source: <https://www.arcweb.com/blog/improve-asset-uptime-industrial-iiot-analytics>



**WORLD CLASS
MAINTENANCE**

Condition Based Maintenance Just right, just in time



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of the **easiest** methods

But **82%** of failures occur
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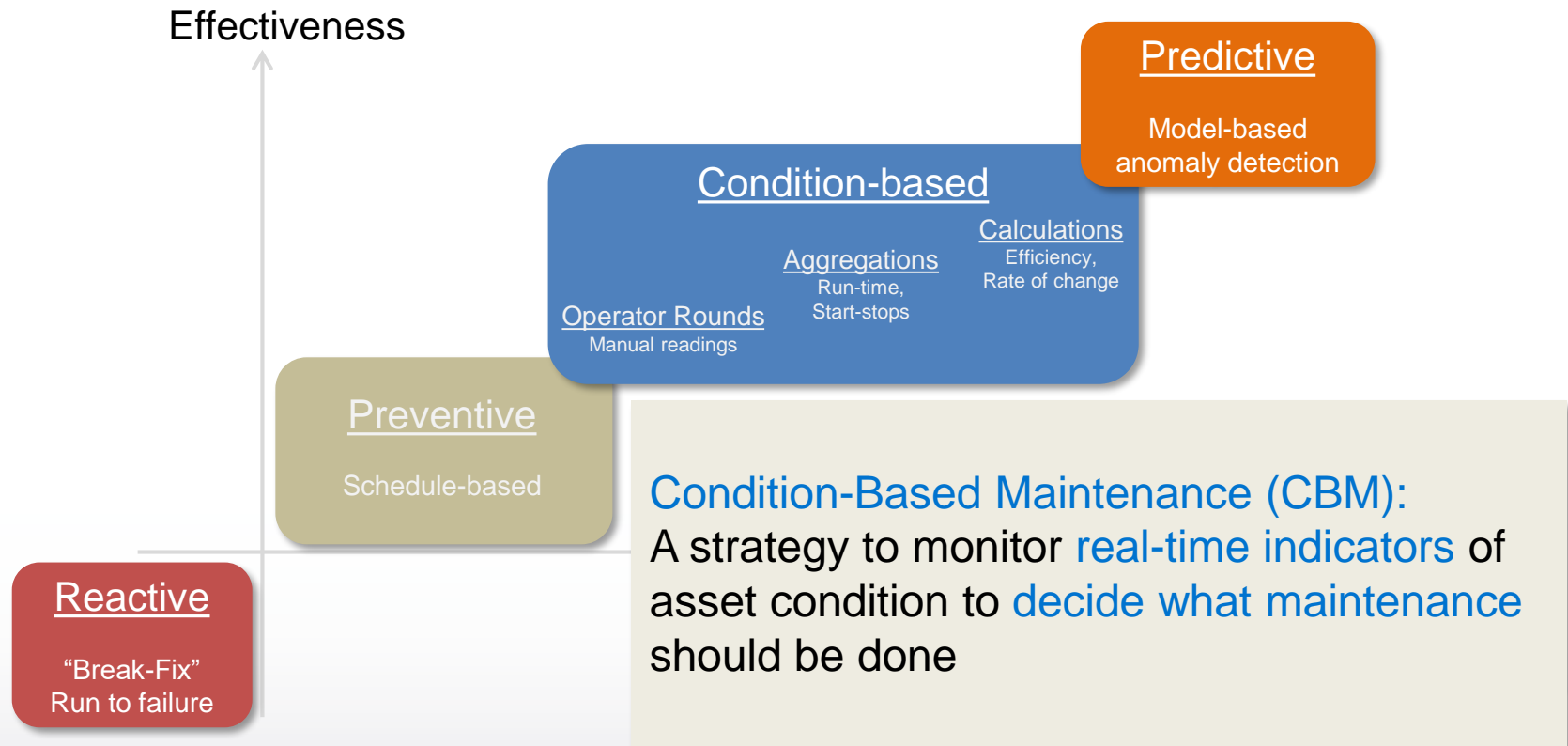
Over-service = Excess costs
"We go out & the asset is pristine"

Replace too early = Purchases

Miss failure = Threat

Condition Based Maintenance:

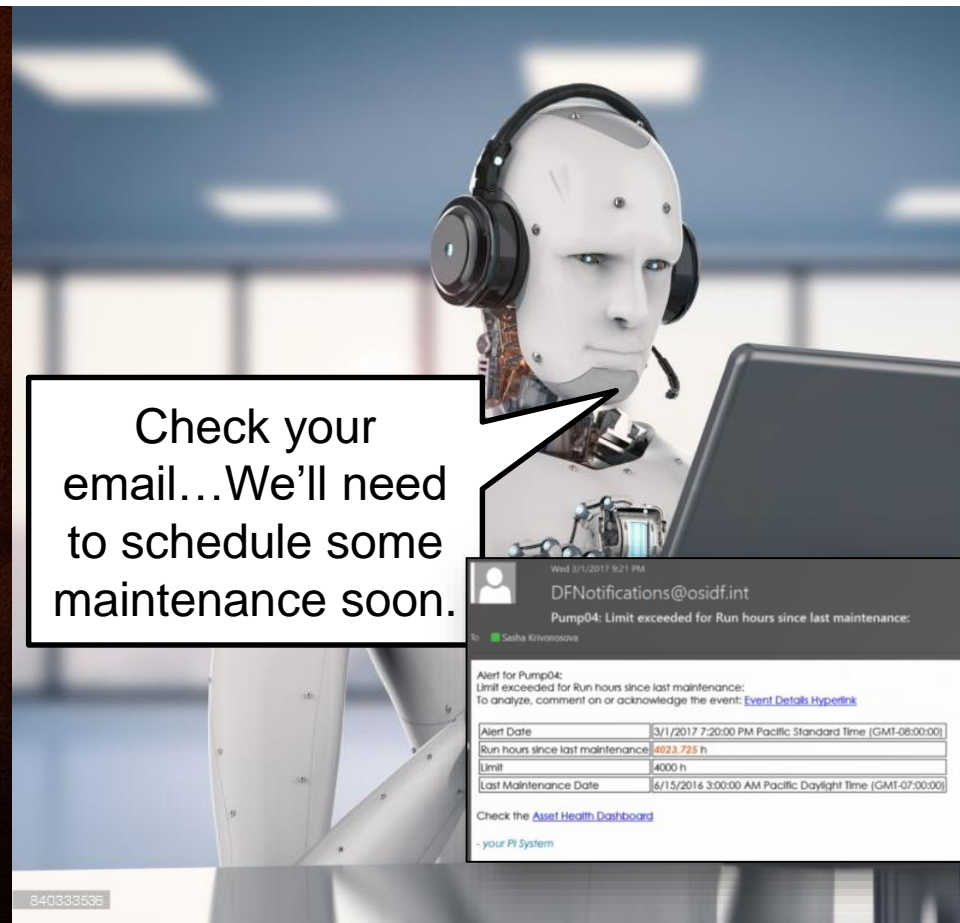
An improved maintenance strategy



Before and After



Pump #3 is down!
Hotshot a part out
here!



Check your
email...We'll need
to schedule some
maintenance soon.

Wed 3/1/2017 9:21 PM
DFNotifications@osidf.int
Pump04: Limit exceeded for Run hours since last maintenance:
To: Sasha Kivromosova

Alert for Pump04:
Limit exceeded for Run hours since last maintenance:
To analyze, comment on or acknowledge the event: [Event Details Hypertext](#)

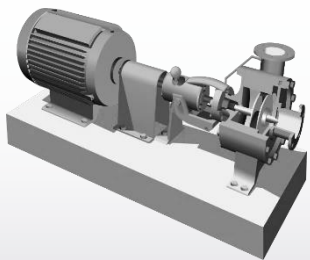
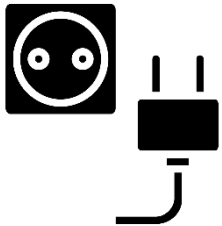
Alert Date	3/1/2017 7:20:00 PM Pacific Standard Time (GMT-08:00:00)
Run hours since last maintenance	4023.725 h
Limit	4000 h
Last Maintenance Date	6/15/2016 3:00:00 AM Pacific Daylight Time (GMT-07:00:00)

Check the [Asset Health Dashboard](#)
- your PI System

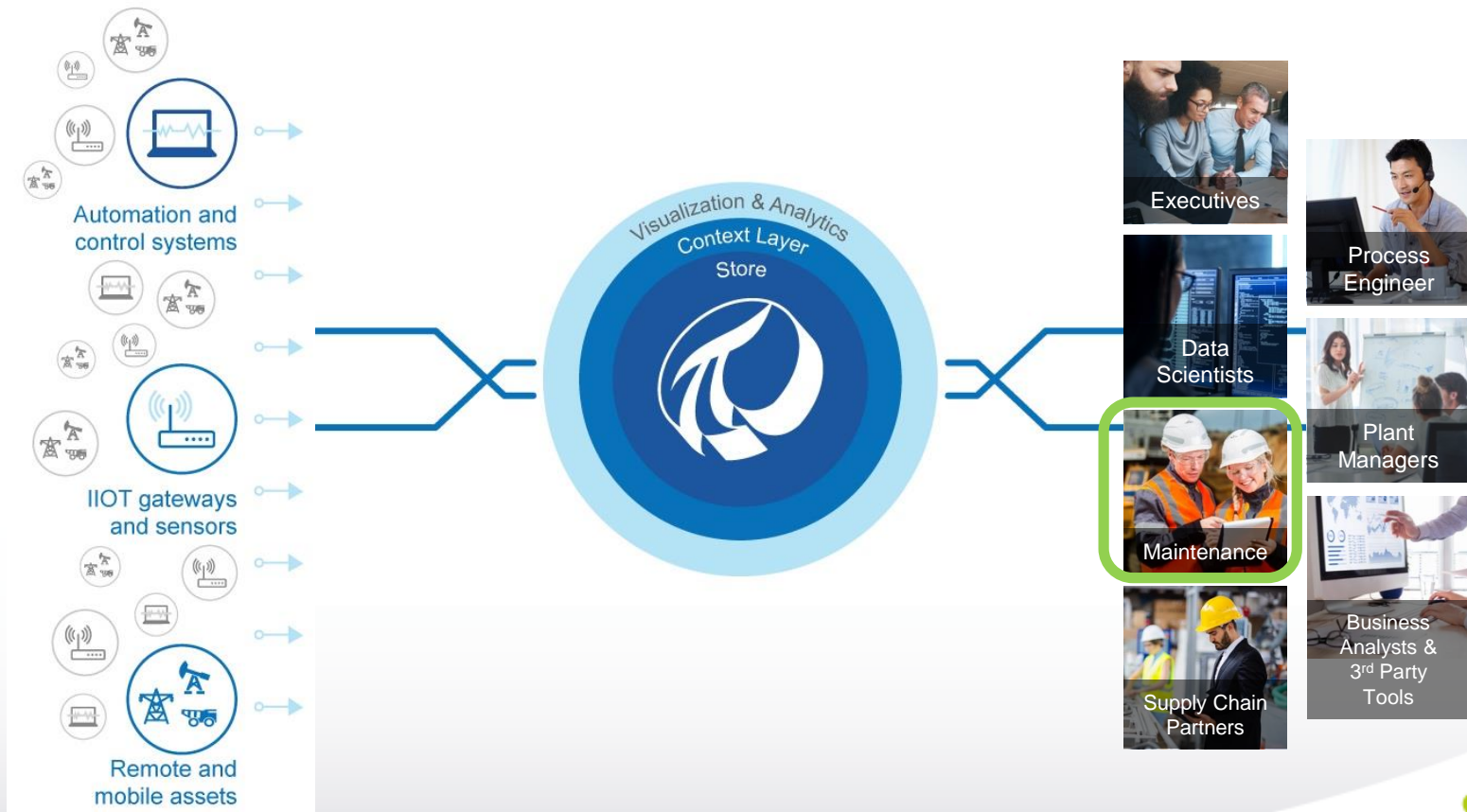


5 steps of CBM

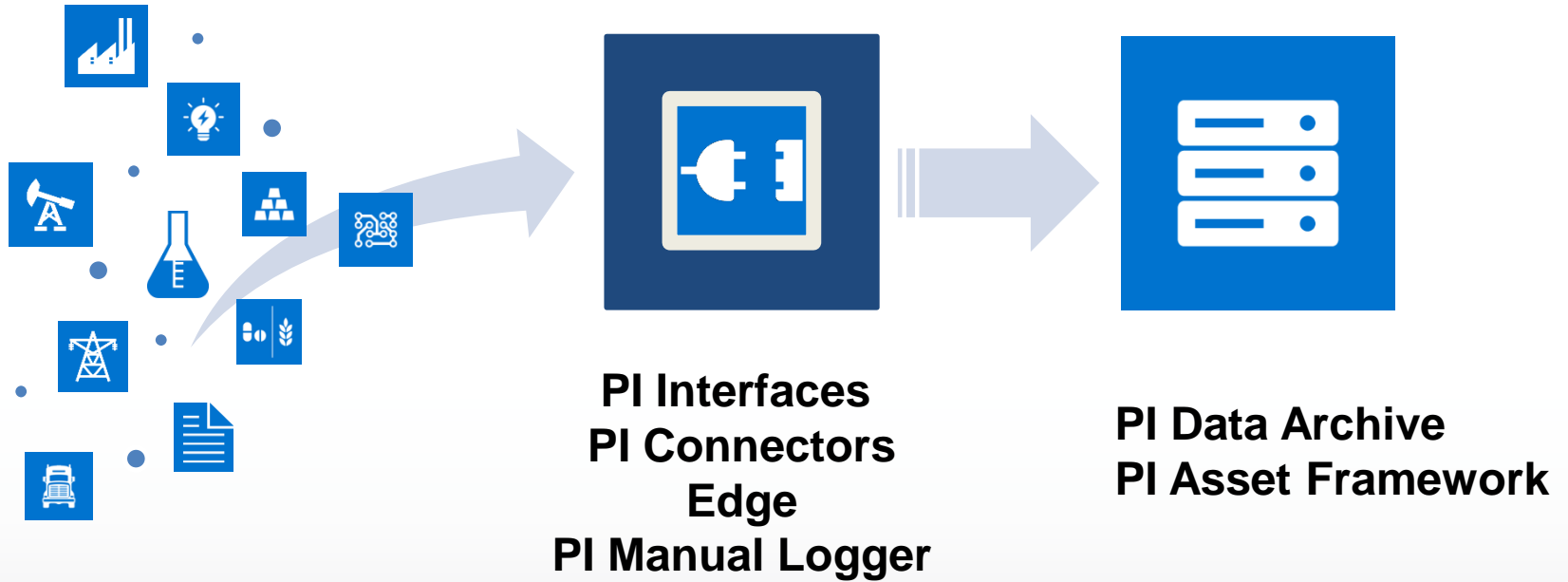
Action



OSIsoft – PI System Data Infrastructure

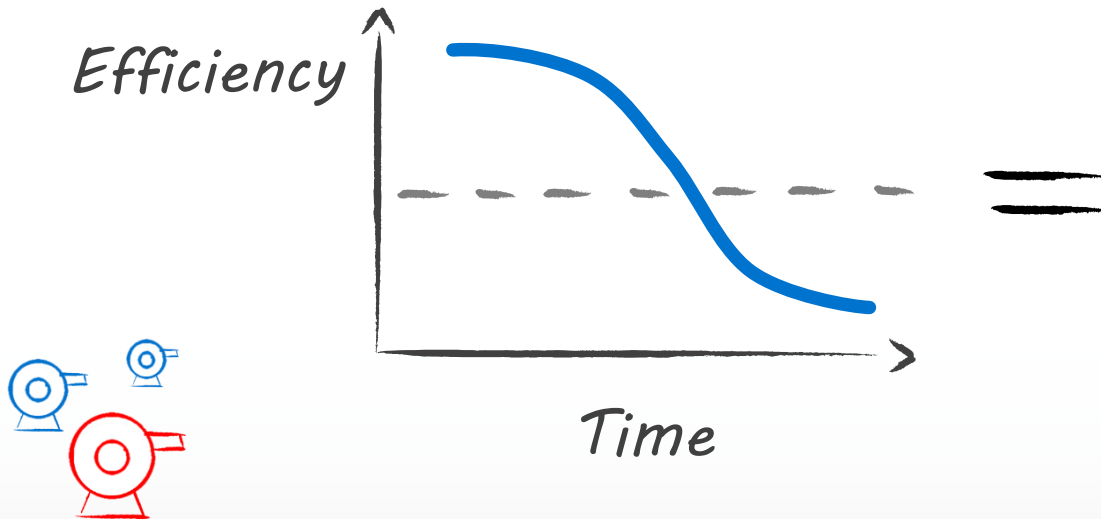


Get the data..



Build a Digital Model

Start small



$$\frac{\text{Flowrate} \times \text{Head}}{\text{Horsepower}}$$

Get these values

- Measurements
- Look-up tables

Traditionally, operations & maintenance data are separate



OPERATIONS

Temperature
Pressure
Voltage
...



MAINTENANCE

Oil analysis
Vibration
Thermography
...

Pump02			
General Child Elements Attributes Ports Analyses Notification Rules Version			
Filter			
Name		Value	Description
Category: Asset Properties			
	Horsepower	5.5 hp	Manufacturer-stated horsepower
	Manufacturer	Pump-U Up	
	Pump Type	Centrifugal	
	Rated Current Draw	25 A	Manufacturer-stated current draw of pump
	Rated Efficiency	85 %	
	Serial Number	Pump02	
	Total Head	130 ft	Manufacturer-stated available pump head
Category: Asset Calculated Data			
	Downtime Reason Code	No downtime event	Last downtime reason code
	Filtered Hourly Flow Rate Average	28.4557 US gal/min	
	Hourly Average Efficiency	16.92956 %	
	Hourly Maximum Bearing Temperature	187.2521 °F	
	Number of Starts Since Maintenance	354 count	
	Operating Time Maintenance Status	Needs maintenance	
	Operating Time Since Installation	2175.899 h	
	Operating Time Since Maintenance	2175.899 h	
	Pump Status	ON	Current pump running state - on/off
	Pump Status - Numerical	1	Current pump state - 1/0
Category: Comparison Based Maintenance Information			
	Filtered Hourly Flow Rate Average	28.4557 US gal/min	
	Hourly Average Efficiency	16.92956 %	
	Hourly Maximum Bearing Temperature	187.2521 °F	
	Rated Efficiency	85 %	

Head
Flow Rate
Efficiency

Maintenance

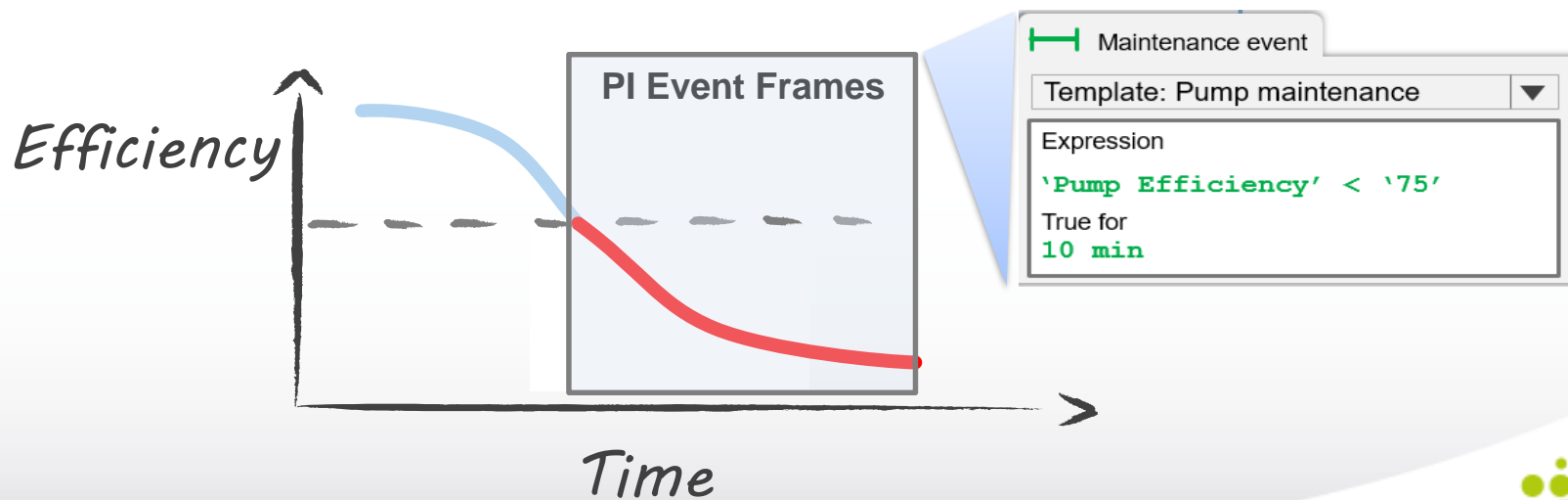


Increase value by bringing data together

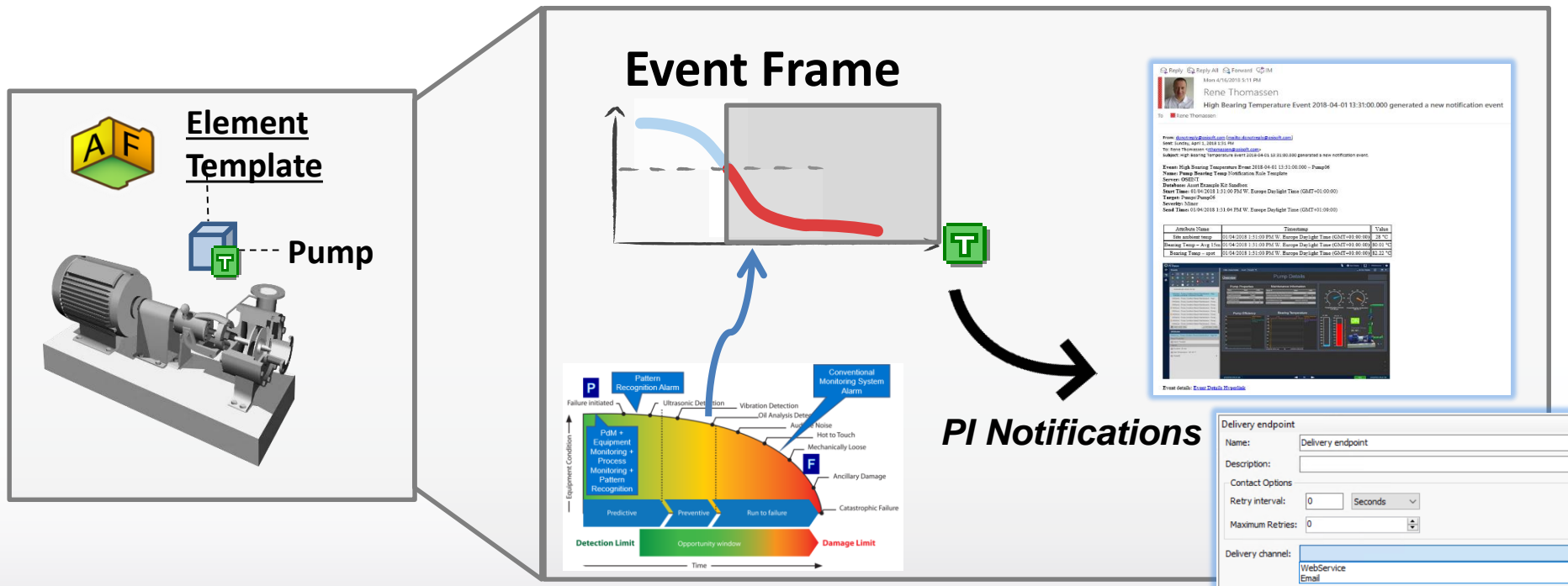
Execute Condition Logic



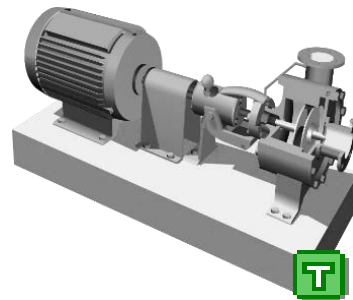
Pump Efficiency < **75%**



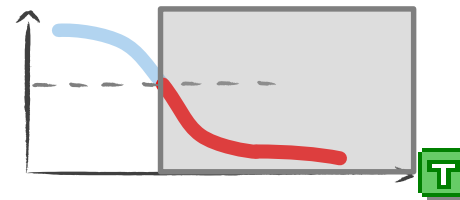
Alert & Notify



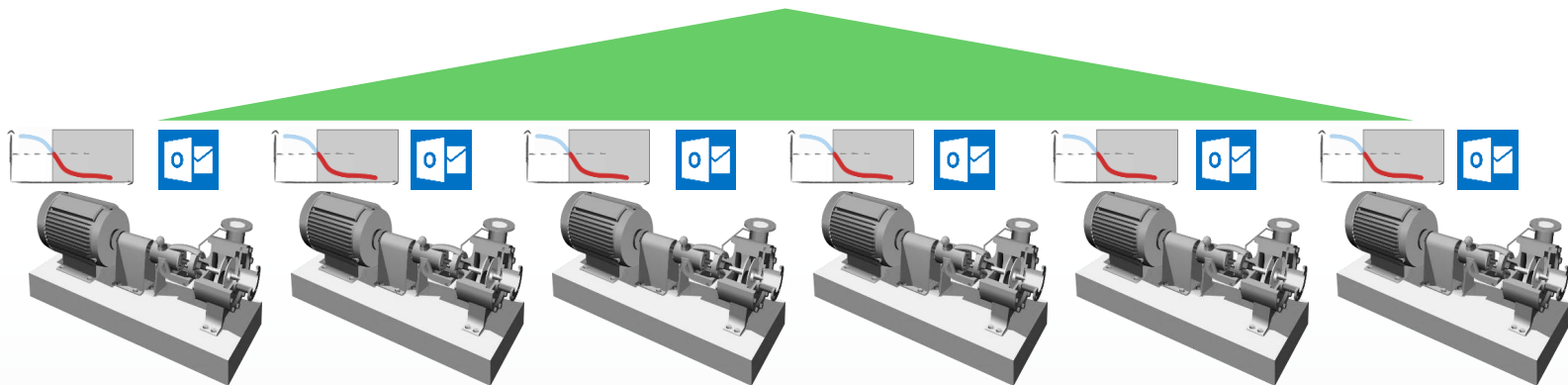
Replicate.. Using templates



Low Efficiency Event Frame



Notification



Visualize



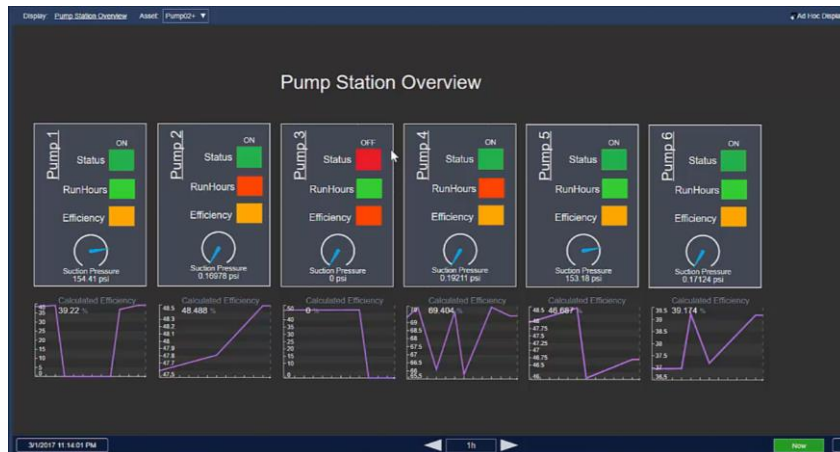
Connect
Collect & Store

Assign Context

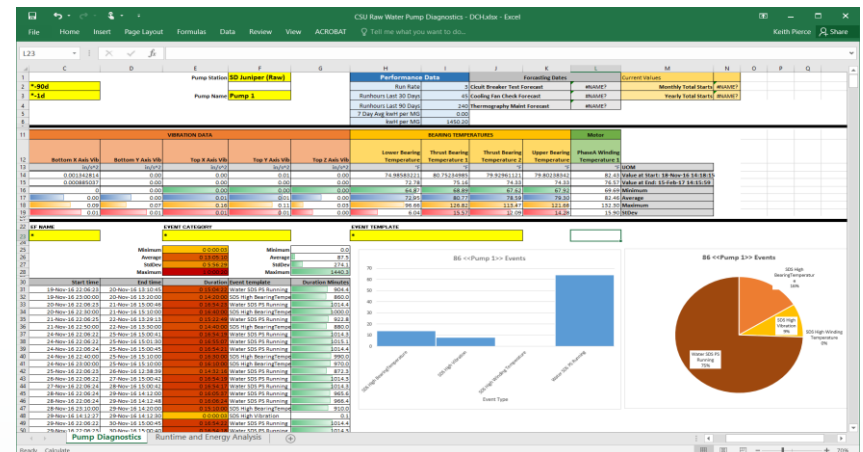
Execute
Condition Logic

Alert and Notify

Visualize



PI Vision



PI DataLink



Excel



Condition Based Maintenance Just right, just in time

Customer example



PI Integrator products

“Cleanse – Augment – Shape – Transmit”

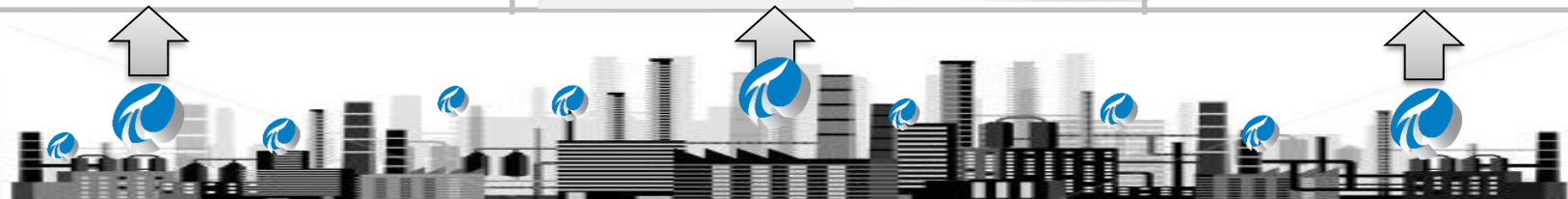
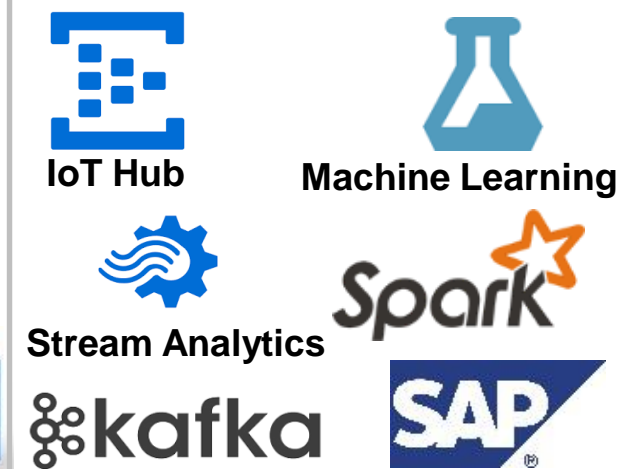
Visual Analytics



Data Warehouse / Data Lake



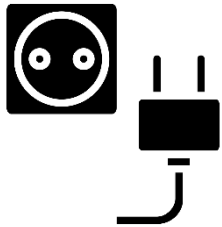
Streaming Analytics



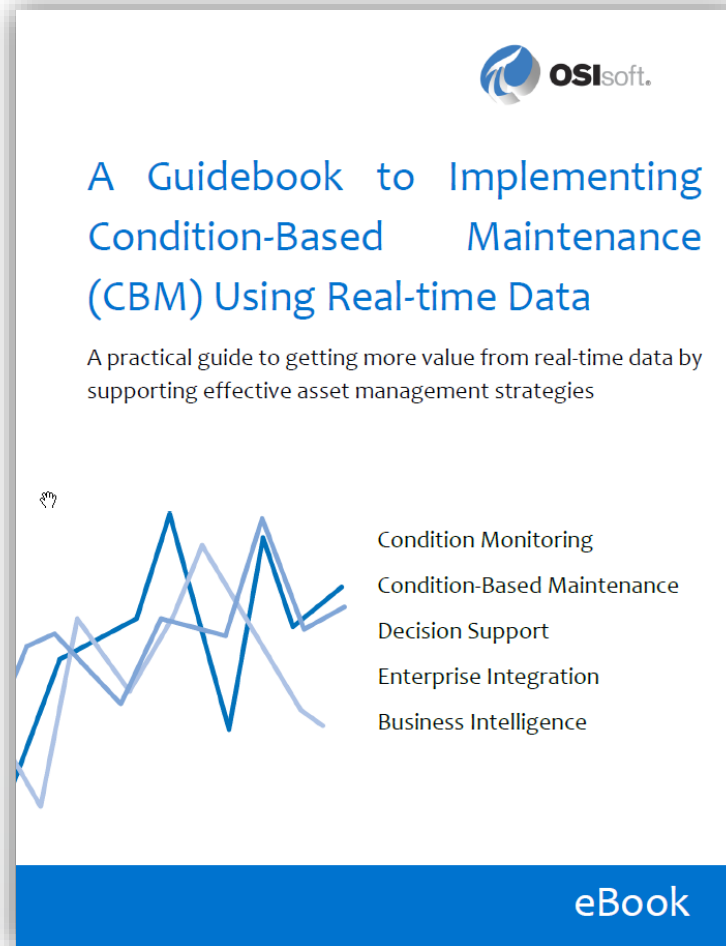
5 steps of CBM -> Success



Action

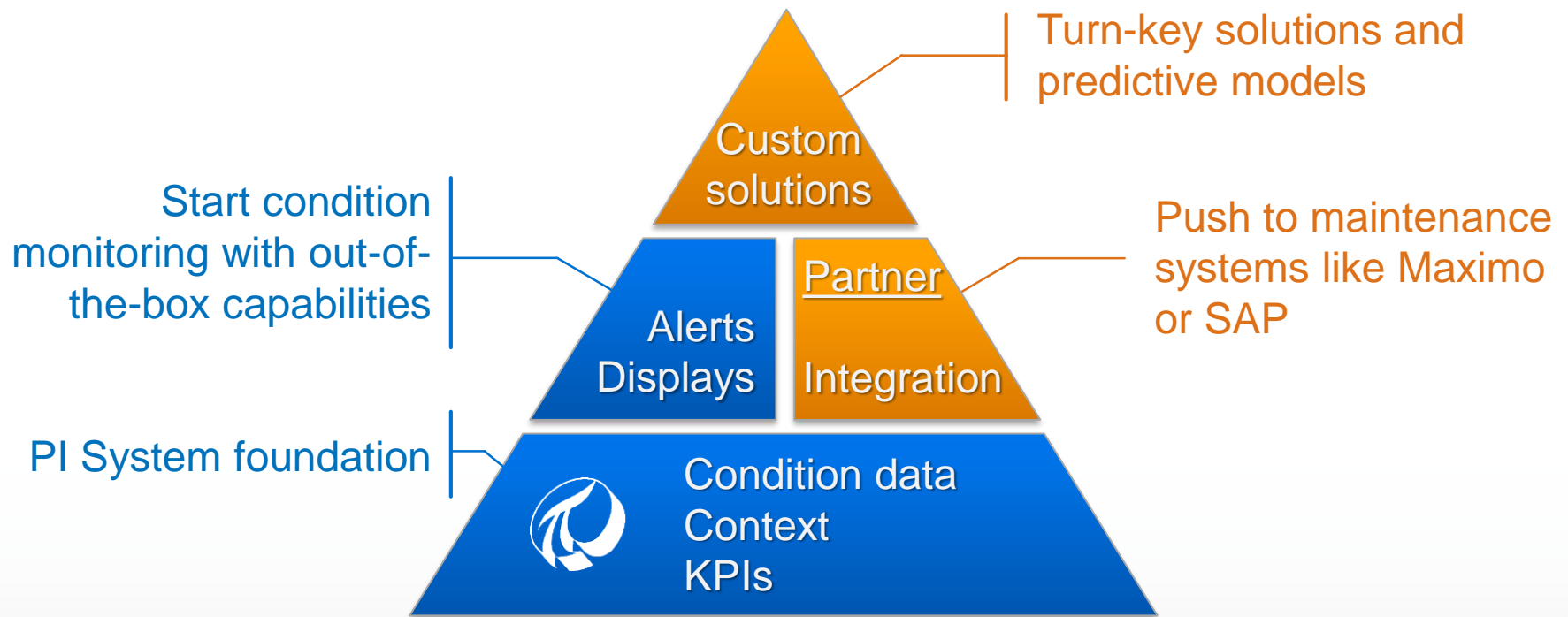


How to start.. Cookbook!



<https://www.osisoft.com/webinars/condition-monitoring-and-cbm/>

Partners – here to help



It's a Journey
step by step with a common vision



... It's Technology, People and Process

Thank you

