



# The HVAC Systems Service Transformation

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## Stepping To the Future

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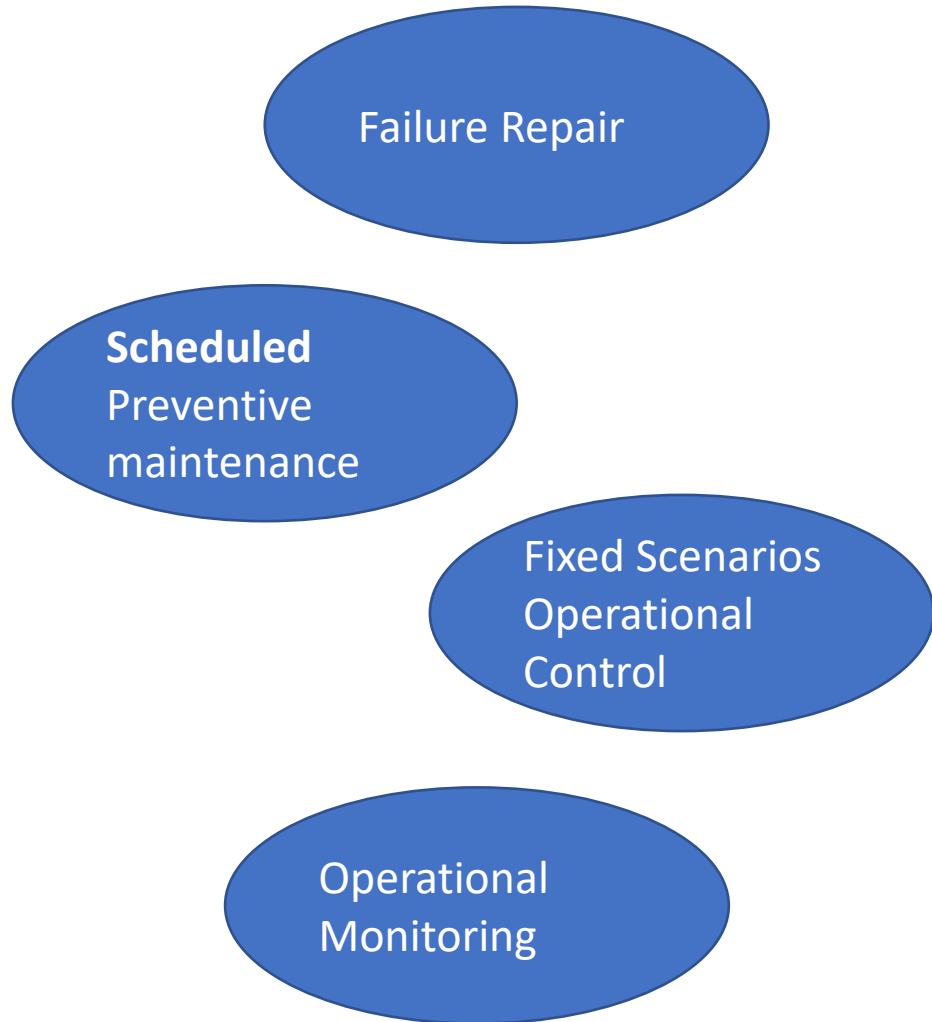


**Electricity & Energy 2021**



The 21st International Annual Convention of SEEEI

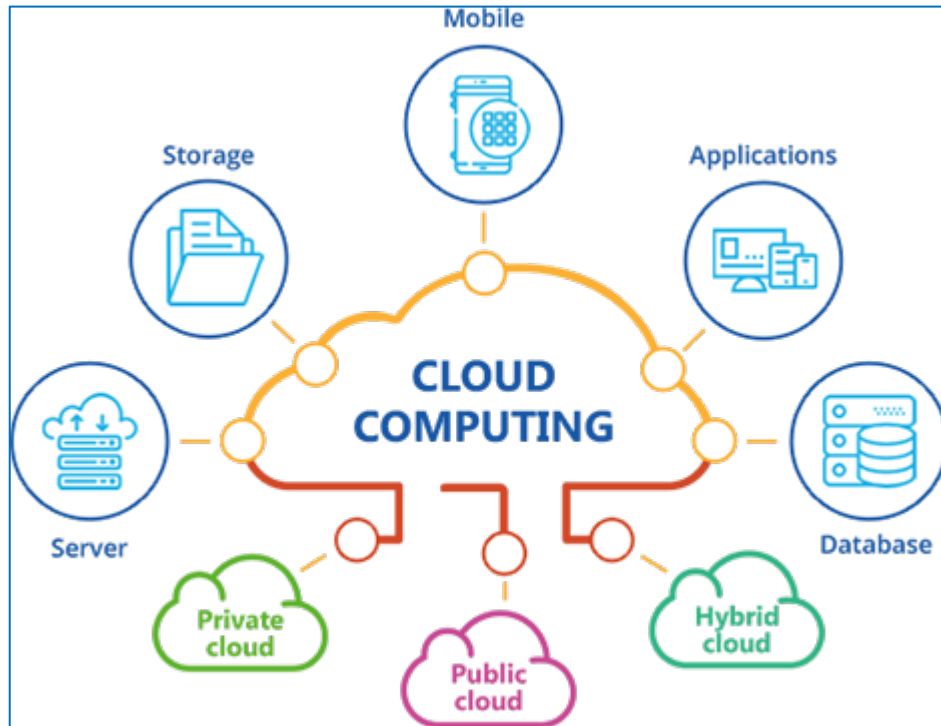
## The Current Perception of Service



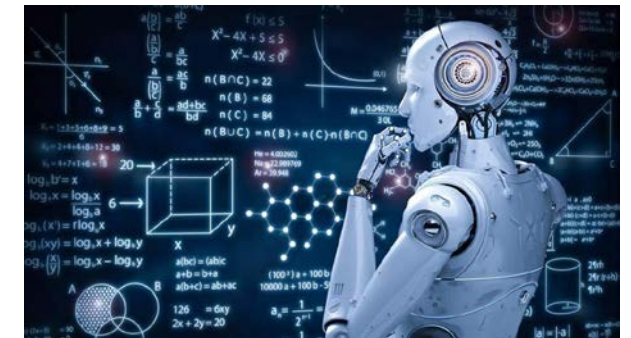
## The Developing Perception of Service



# The Technology Edge – Making the Future Service Possible and Affordable

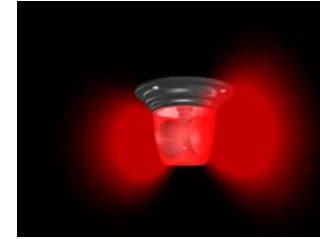


**Communication and Internet**



**AI & ML**

If you knew your chiller is going to fail



And could identify the reason  
in real time

What problems would you solve?

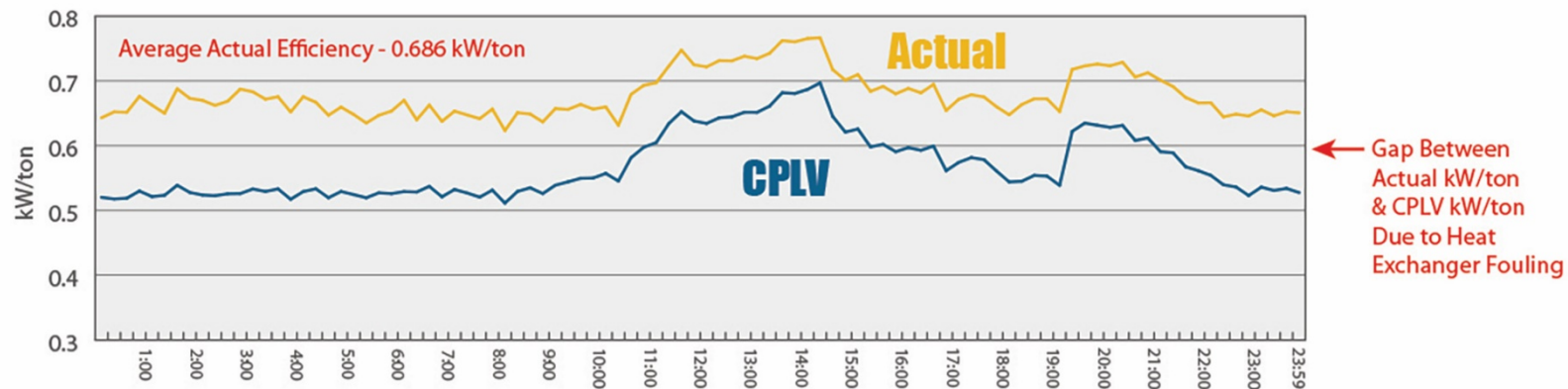
If you knew your piece of equipment became less efficient



And could identify the reason

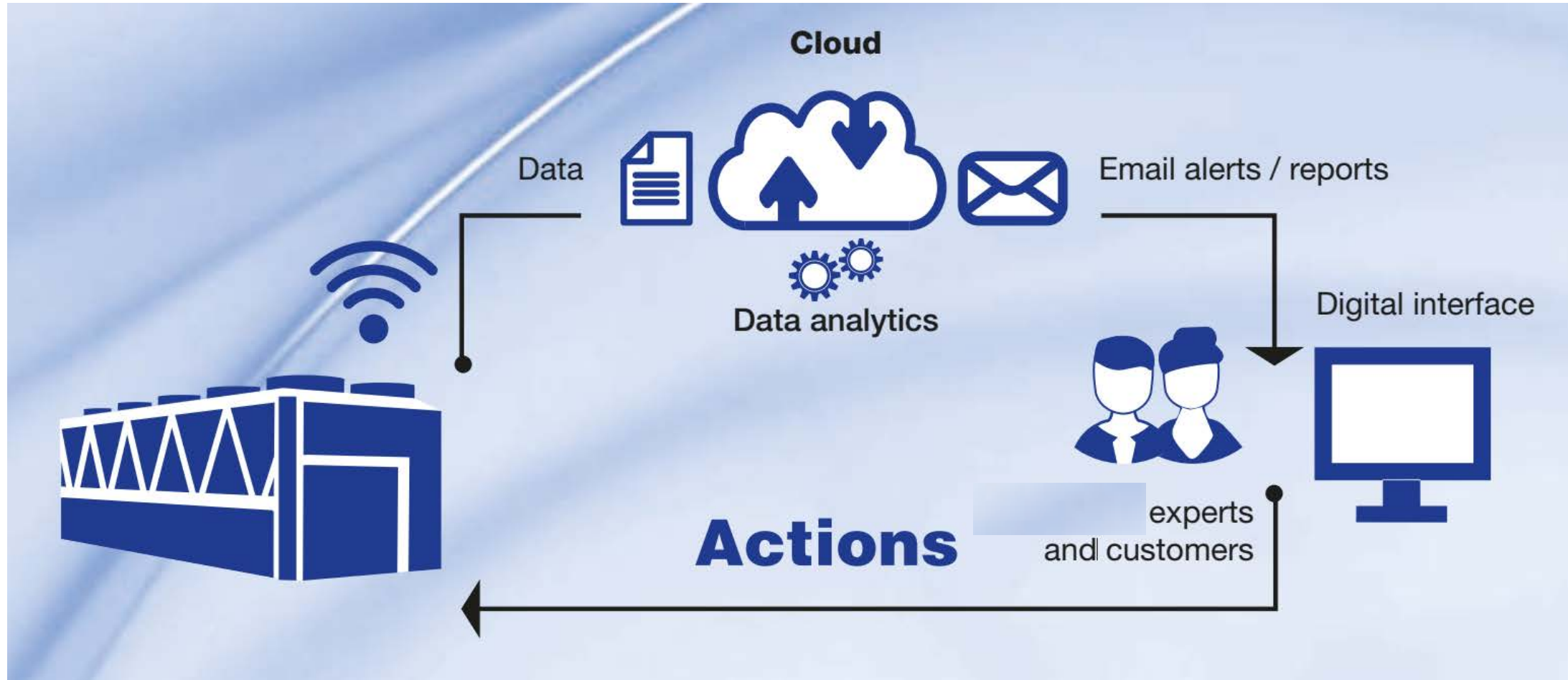
What will You do?

Chart 1: Impacts of Heat Exchanger Fouling on Chiller Performance



## Connected Services – 24/7 365 Days a Year Monitoring, Analyzing and Service from Anywhere

- ✓ **Connected services** enable service transformation from traditional reactive time based maintenance to predictive **Condition Based Maintenance**, allow you to track and monitor HVAC equipment system performance in real time and to take preventive and corrective actions remotely.



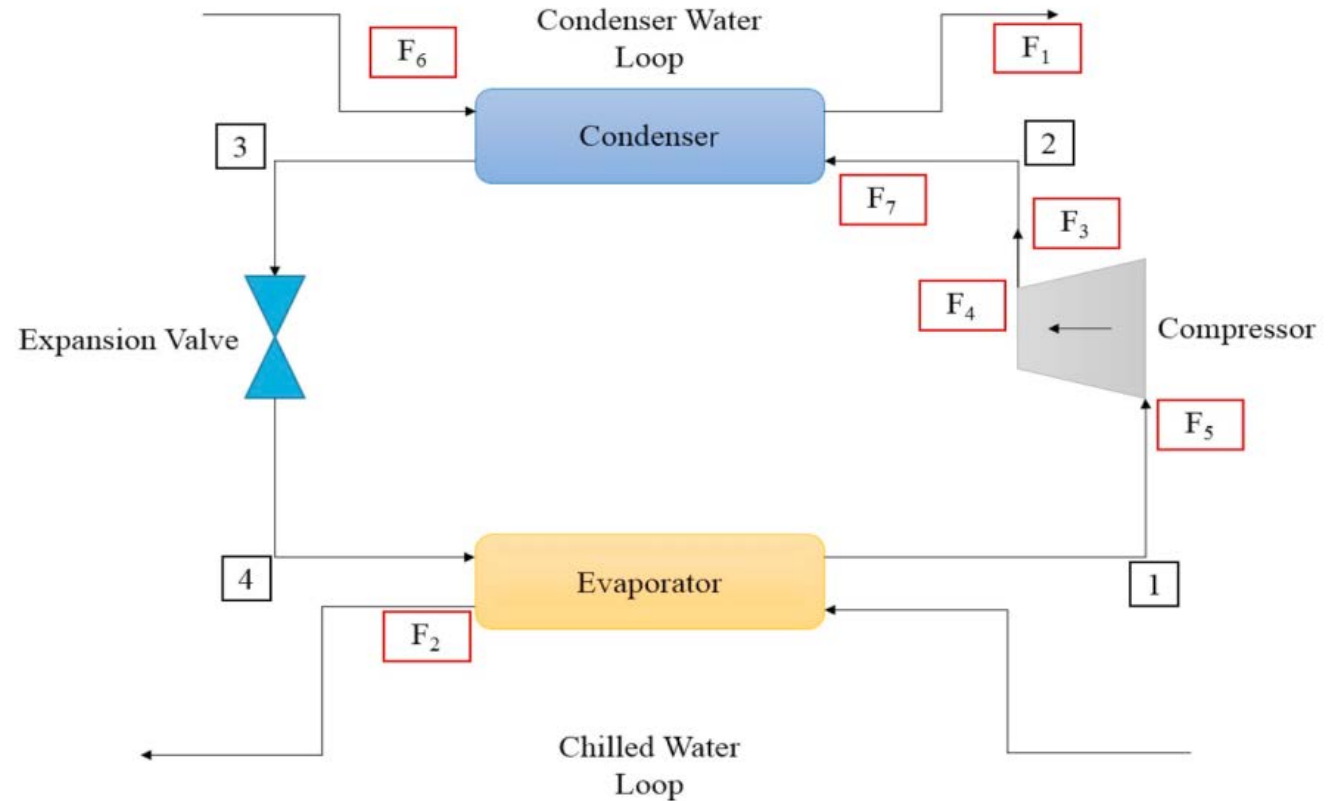
# Connected Services – ASHRAE Guidelines for analytical machine health monitoring

## ✓ Connected Maintenance – FDD SAMPLE Based on ASHRAE RP-1043 and ASHRAE GL-36

1. Reduced condenser water flow (F1)
2. Reduced evaporator water flow (F2)
3. Refrigerant Leak (F3)
4. Refrigerant Overcharge (F4)
5. Excess Oil (F5)
6. Condenser Fouling (F6)
7. Non-condensables in Refrigerant (F7)

Details of the severity levels for seven typical chiller faults (from F1 to F7), reported by ASHRAE project number 1043-rp.

Type	Severity Level 1	Severity Level 2	Severity Level 3	Severity Level 4
F1	10% reduced in flow	20% reduced in flow	30% reduced in flow	40% reduced in flow
F2	10% reduced in flow	20% reduced in flow	30% reduced in flow	40% reduced in flow
F3	10% reduced in charge	20% reduced in charge	30% reduced in charge	40% reduced in charge
F4	10% increased in charge	20% increased in charge	30% increased in charge	40% increased in charge
F5	14% increased in charge	32% increased in charge	50% increased in charge	68% increased in charge
F6	12% reduced in tubes	20% reduced in tubes	30% reduced in tubes	45% reduced in tubes
F7	1% by volume Nitrogen	2% by volume Nitrogen	3% by volume Nitrogen	5% by volume Nitrogen



# Connected Services – Converting the Data to Knowledge and Action

## ✓ Data Storage & Data Analysis of the Monitoring Data



### Synoptics

Visualize the synoptic of the installation in real time, the status of each component, the temperatures, pressures, flows, operating mode,...



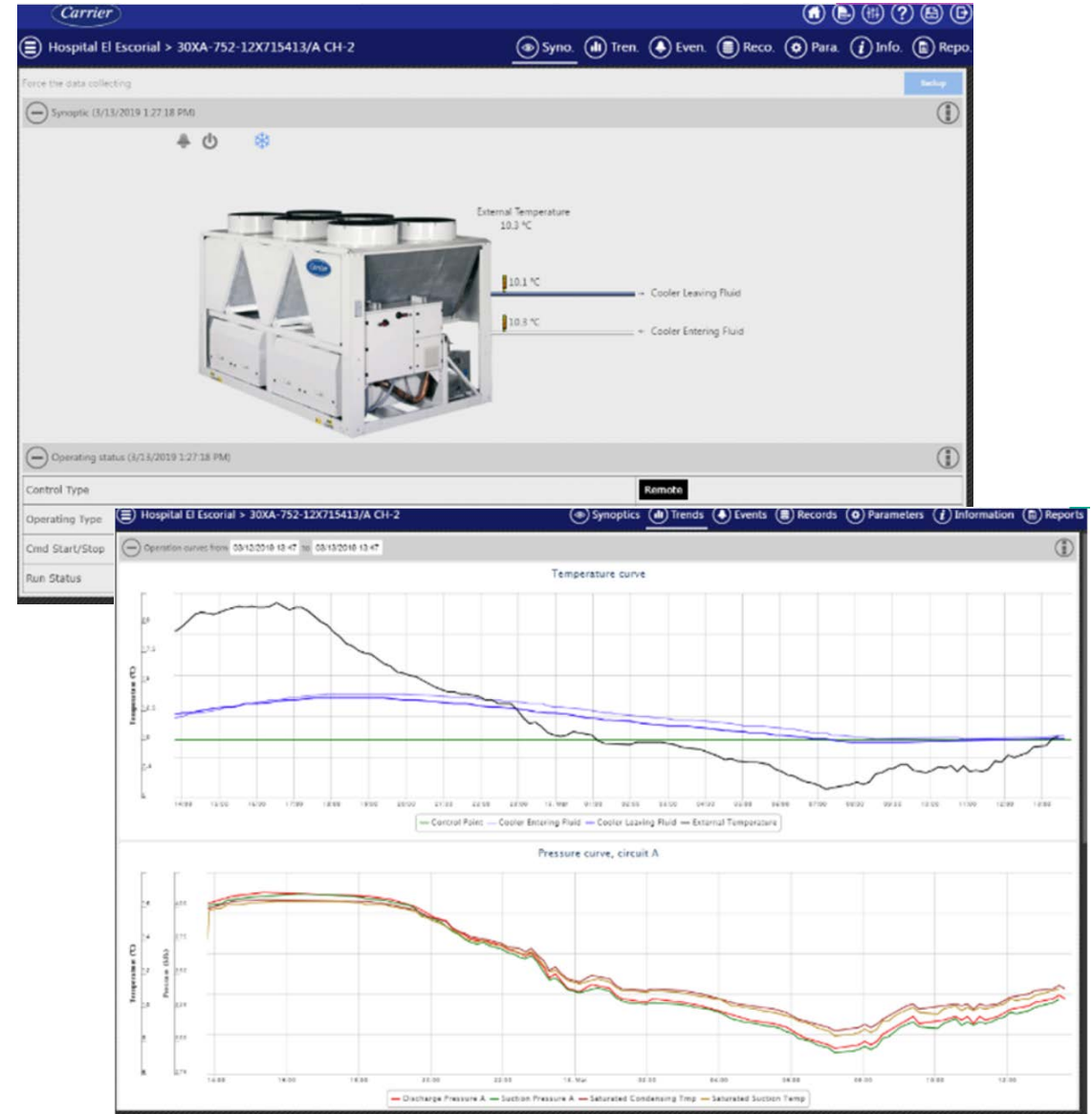
### Trends

Visualize the predefined trends or design your own trends (temperatures, pressures, modes, status,...)



### Events (real time and archives)

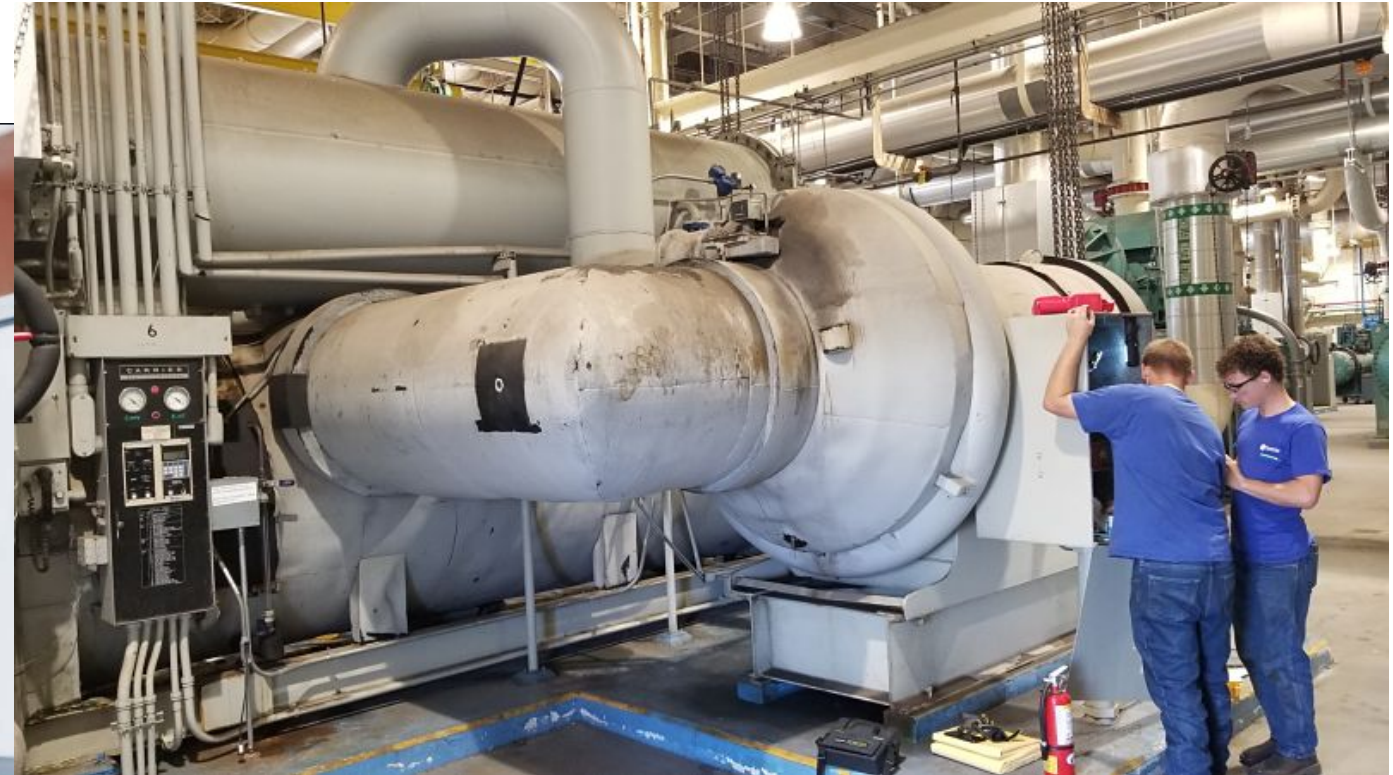
Visualize the list of events





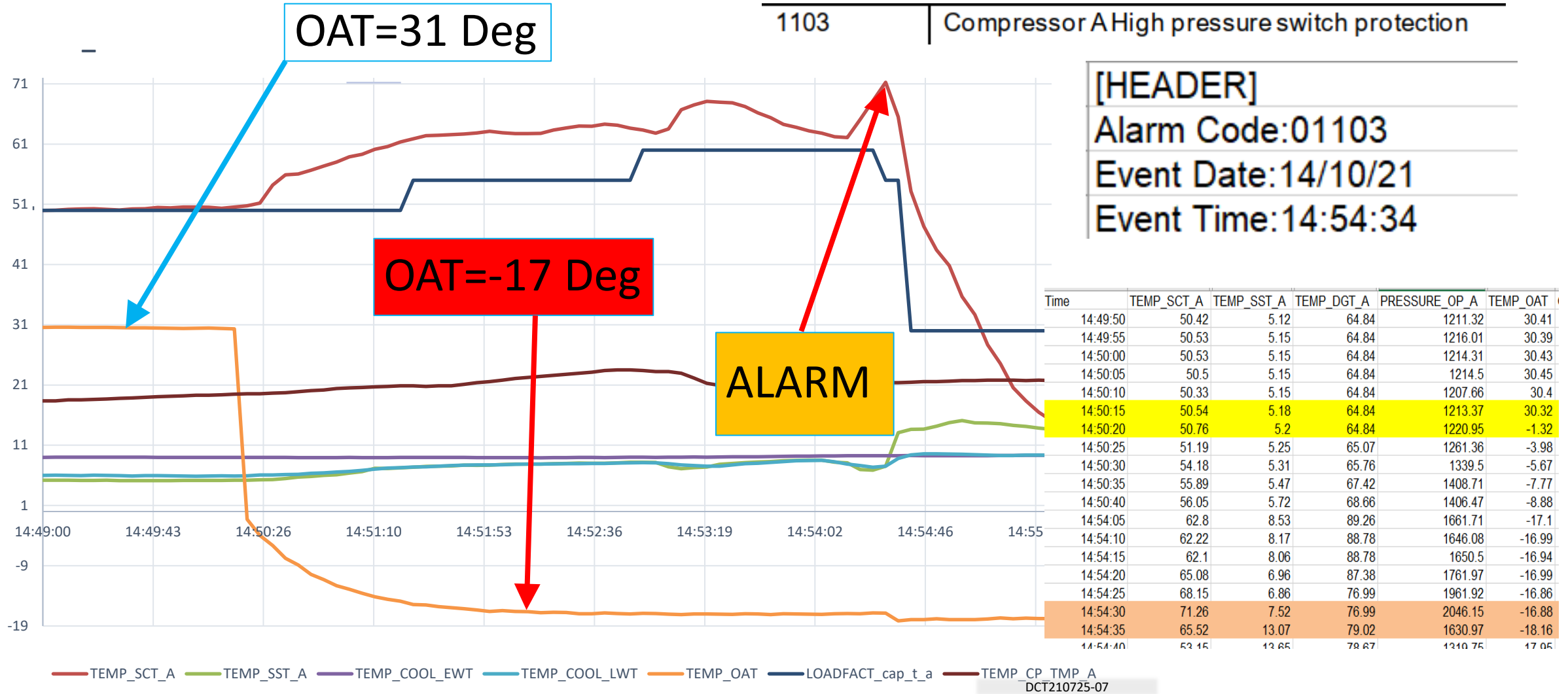
## Connected Services – Remote Support

- ✓ **Remote Support** – Make the Experts supporting your facility



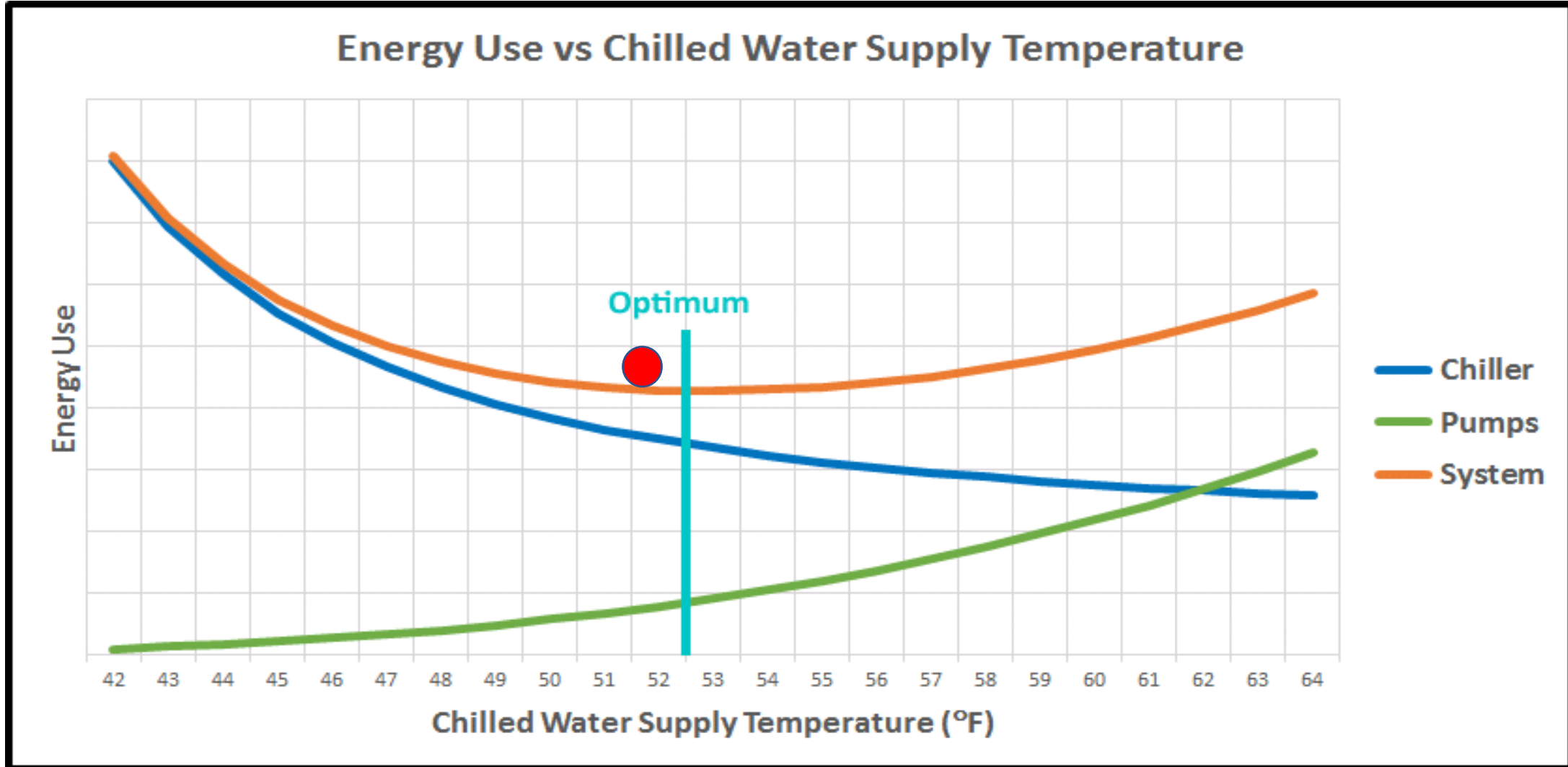
# Connected Services – Enhance Diagnostic Capability

## ✓ On-Site Maintenance



## Connected Services – [Dynamic Optimization](#)

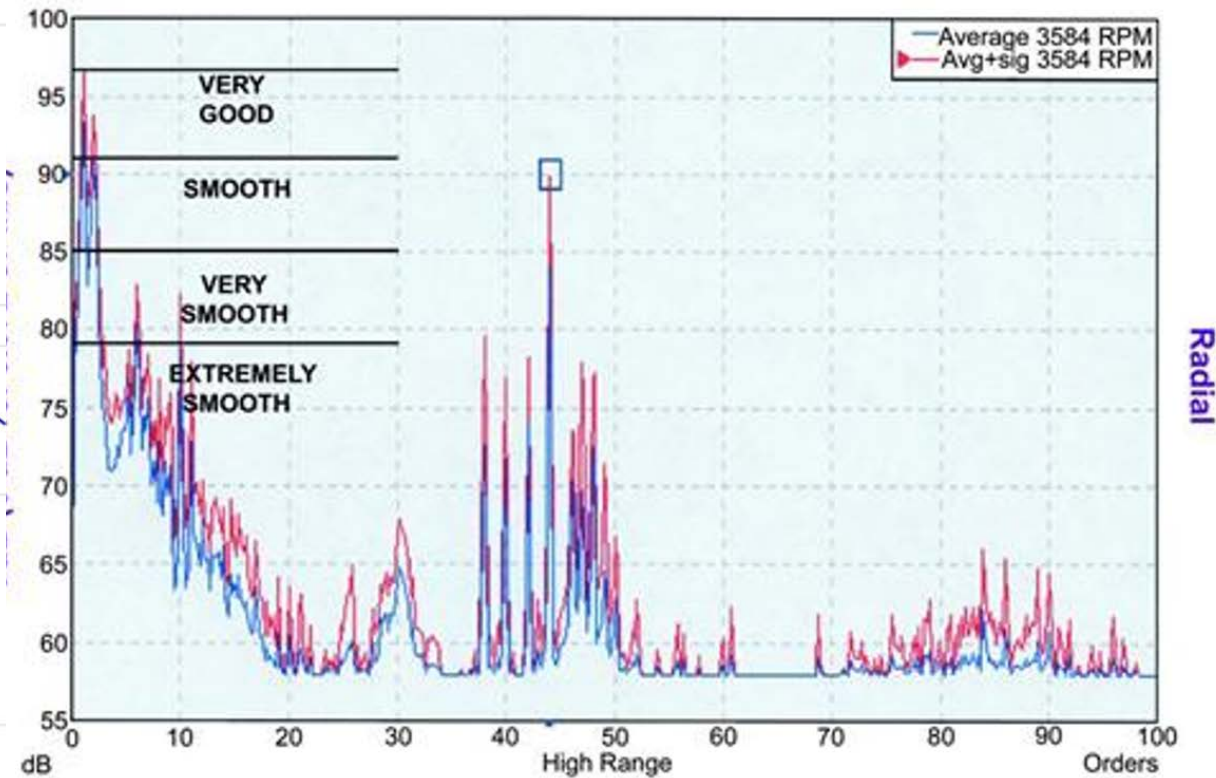
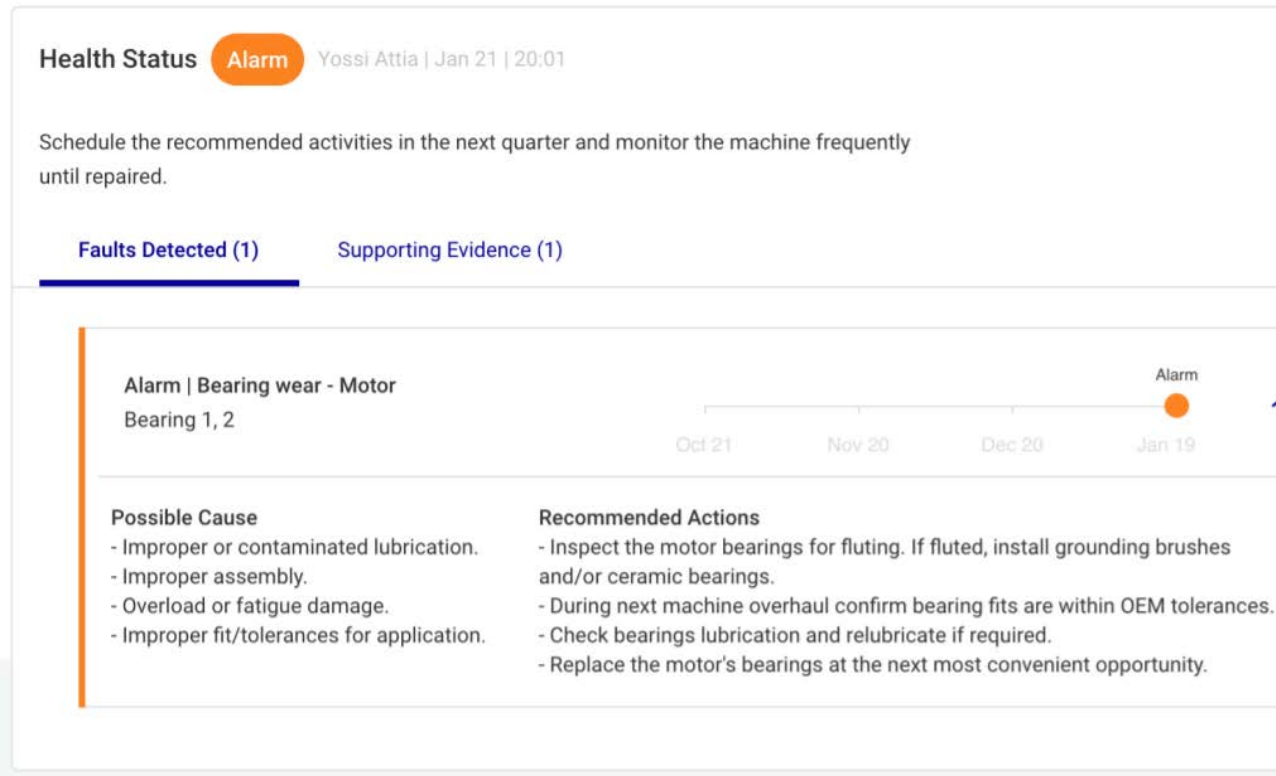
- ✓ Advanced Set point Optimization to reduce energy consumption



# Connected Services – Health monitoring to predict failures

## ✓ Predictive Vibration Analyses System

**SITUATION:** Vibration monitoring is used to diagnose the condition of equipment and allow service personnel to take corrective action before major damage occurs. Service technicians and owners often need to know what an acceptable level of vibration is.



# Connected Services – Intuitive Man Machine Interface

- ✓ HVAC Equipment and system optimization – Energy Reports samples

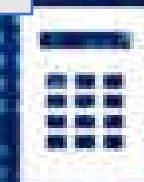


If you knew the **state of everything**

**BIG DATA**

And could **reason on top of that data...**

What problems would you solve?





Questions?

Thanks For Your Attention !