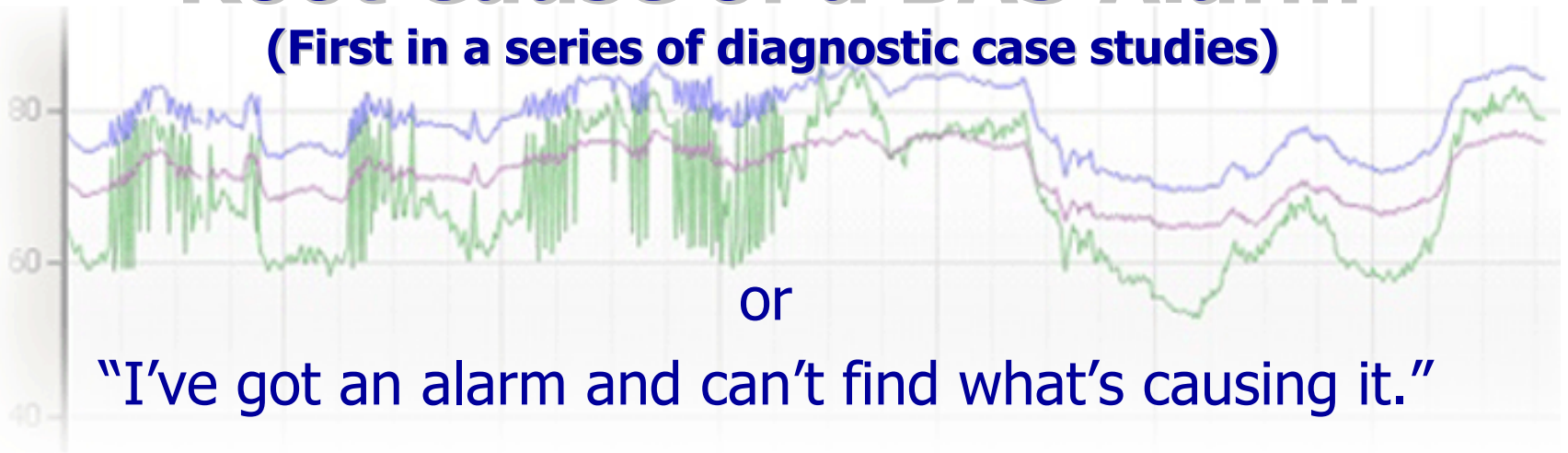




## Case Study:

# Using EnergyWitness™ to Find Root Cause of a BAS Alarm

(First in a series of diagnostic case studies)



“I’ve got an alarm and can’t find what’s causing it.”

# Problem

Water temperature leaving cooling tower was not meeting set point.

All we knew was:

- ✓ The first indication of the issue from the BAS was an intermittent alarm
- ✓ Alarms came from cells 2 and 3 of the three-cell system
- ✓ Problem was going on for several weeks without being able to identify the cause

# Challenge

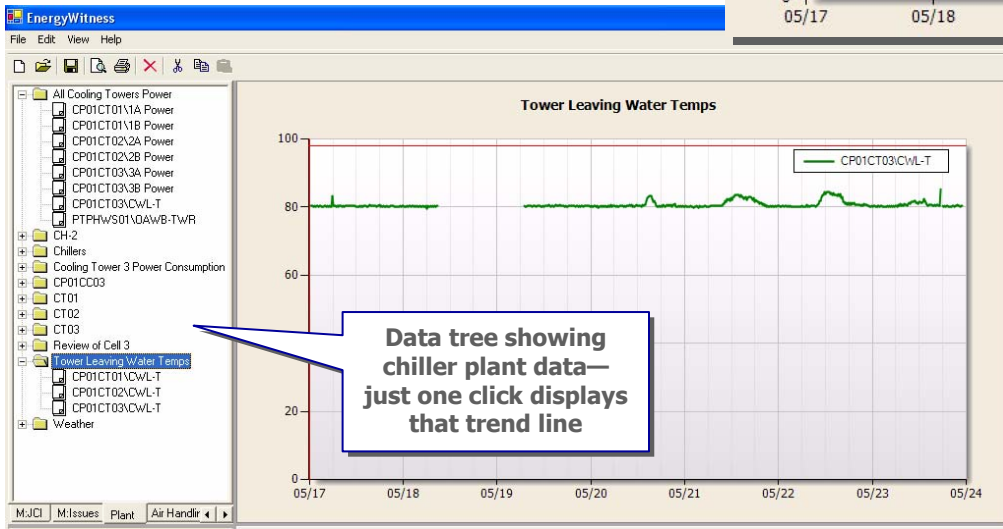
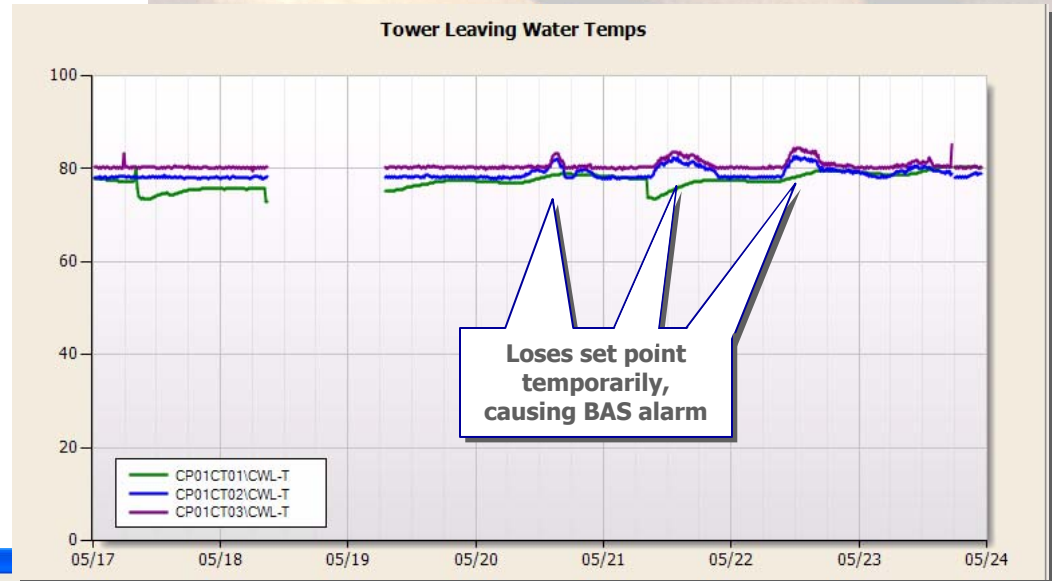
With no prior knowledge of the systems or operations at this facility, use EnergyWitness to find the root cause of the problem (not the symptom)

# Find What is Triggering the Alarms

First we looked at the water temperatures leaving the cooling towers for each cell.

Tower 3 had the most difficult time achieving set point (80°F).

This takes just a few seconds dragging in trends from EnergyWitness' data tree.

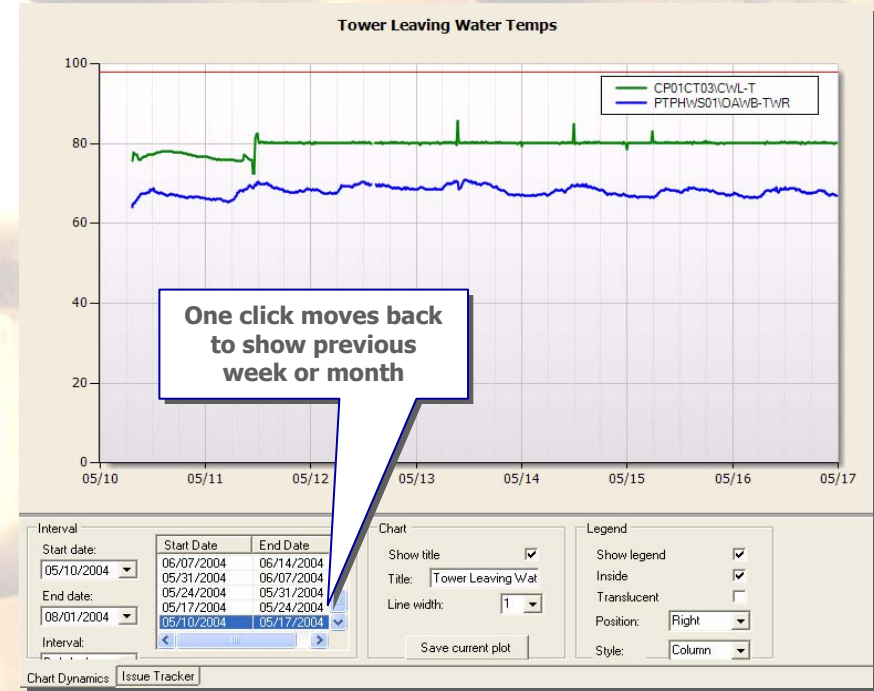
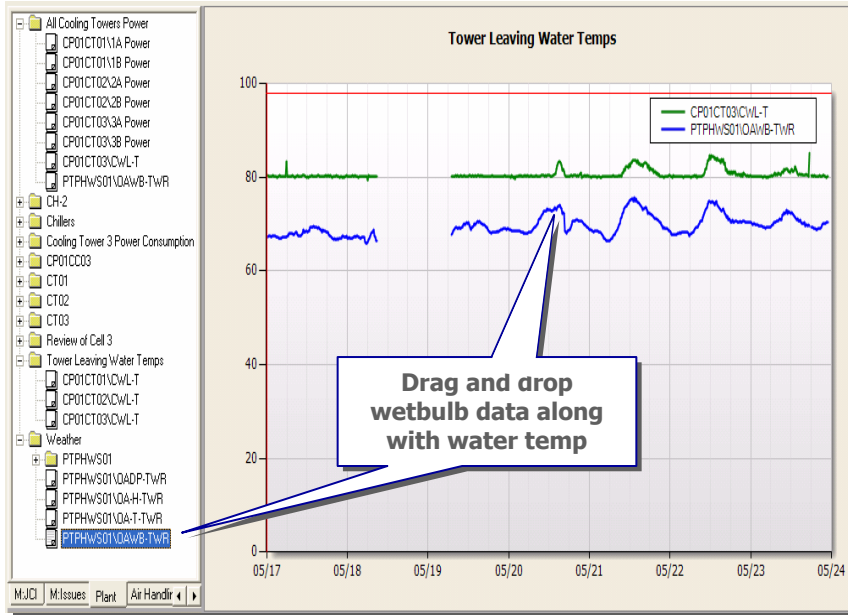


We confirmed that set point was not consistently maintained, and we can show why (and when) the alarm was intermittent.

We'll continue using only the trend line for tower 3.

(Note: the trend line gaps are due to networking issues with the BAS.)

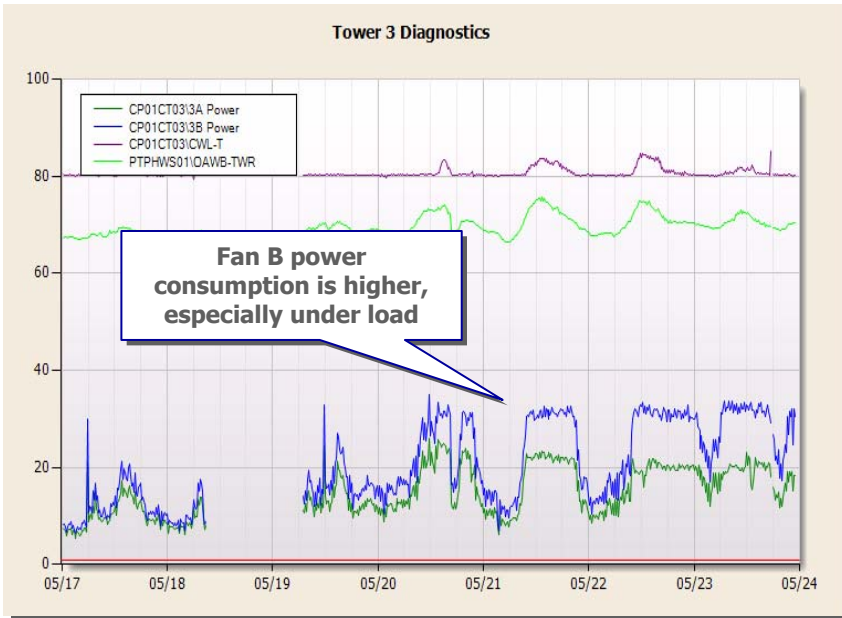
# Look for a Correlation with Weather



For the next step we checked the weather conditions and added (by drag and drop) the tower wetbulb temperature into the chart.

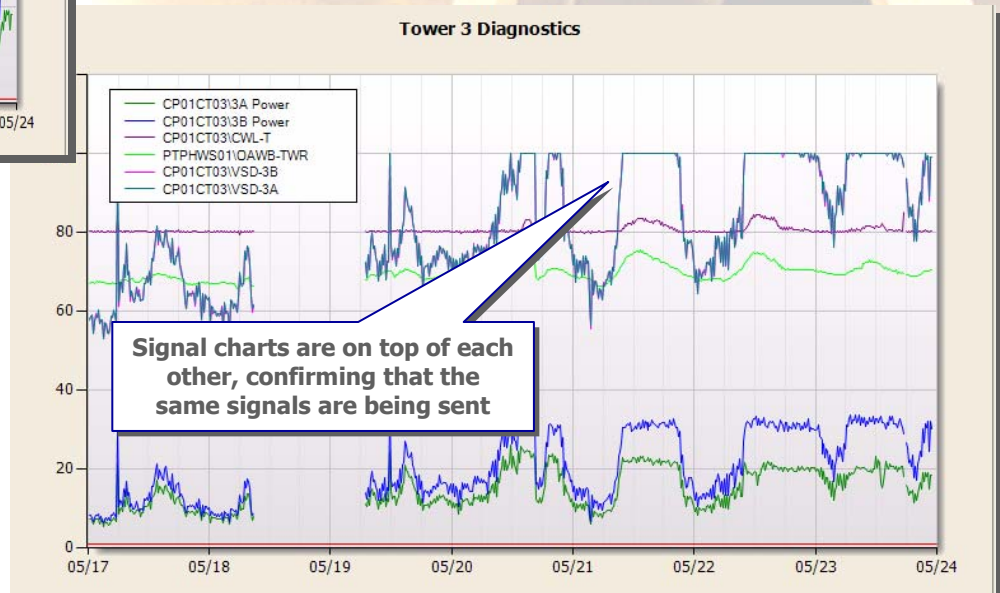
Going back in time for a week (takes just 2 seconds with EnergyWitness) we can now conclude that when the wetbulb temperature exceeds 73.4°F the tower cannot maintain set point.

# What Else can we Learn about this Cell?



We looked at how much power the two cooling tower fans were using, and immediately noticed that two identical fans drew very different amounts of power. Notice that the difference is much greater when a heavier load exists, corresponding to the increases in wetbulb temperature.

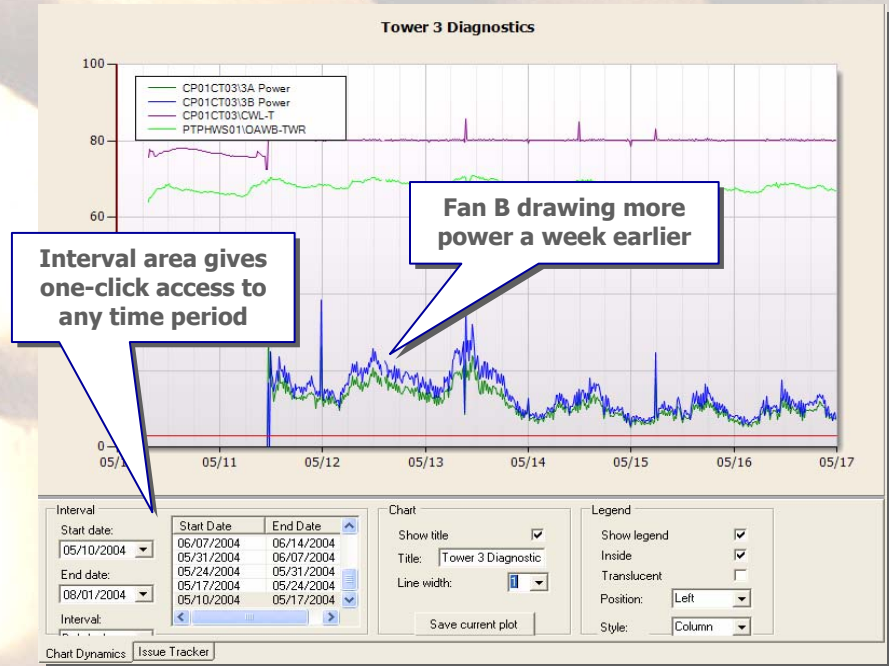
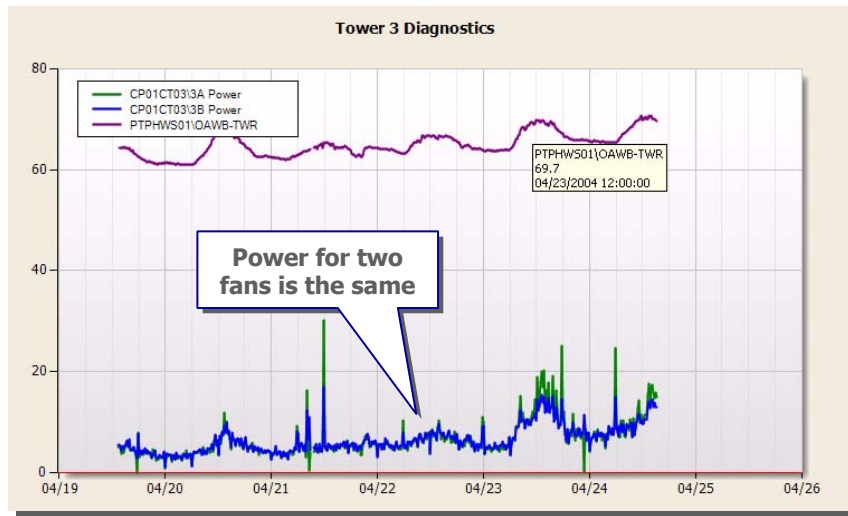
We can't confirm that the fans are running at the same speed because no BAS point exists to record that data. But we can look at the signals sent to each variable speed drive (VSD)—just drop them onto the chart.



# Investigate Fans Signal/Power Issue

Both fans received the same signal but responded very differently. How long has this been going on?

A quick click on the previous week in the time interval area shows that fan B has been using more power for a while.



Looking back several weeks we can see both fans in near unison. However, the wetbulb temperature never exceeds 70°F this early in the year.

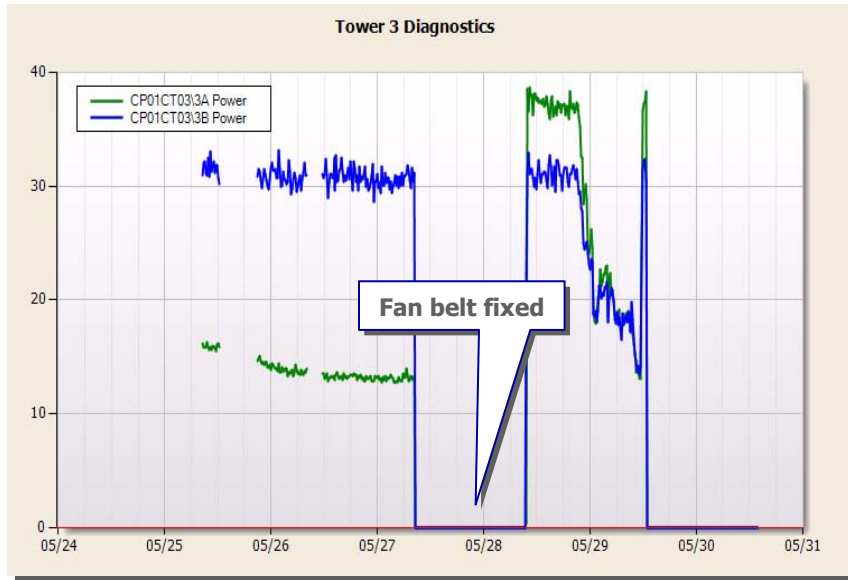
# Diagnostics Conclusion

- We concluded that the problem was likely a fan belt slipping because it was a variable speed drive.
- The fan belt was checked and found to be loose.
- It was tightened and now we can look at the affects of the belt tightening.

(Getting to this conclusion took about 20 minutes. Remember, the diagnostician was completely unfamiliar with the physical plant, and the engineers with years of experience at that facility had been unable to resolve the issue over multiple weeks. As this clearly shows, it's a lot easier when you actually have the data.)

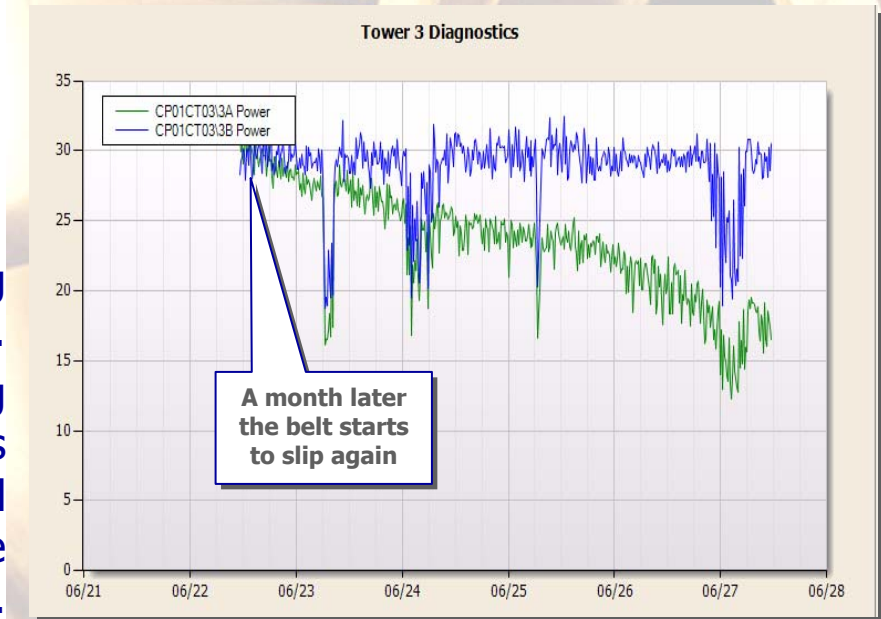
***Now on to the verification process and monitoring!***

# Verify the Fix, then Monitor



The tower cell was taken down while the fan belt was tightened.

We see immediately when it comes back on line that fan A now uses more power than fan B (actually there are more problems with this tower than just the belts) but we can't go into that now.



With EnergyWitness we can monitor ongoing operations in few seconds.

In this case we discovered the belt slipping again just a month later. Ultimately it needs more than tightening, it needs replacing—and now they have the data to prove the expenditure is warranted.

# Summary

## Problem

The water temperature leaving the cooling tower wasn't consistently maintaining set point, causing intermittent alarms from the BAS.

## Challenge

Find the root cause of the problem by having an IDS diagnostician armed with EnergyWitness review the data (who was otherwise unfamiliar with the physical equipment).

## Resolution

- With EnergyWitness, we were able to determine that the likely problem was a slipping fan belt in only 20 minutes.
- With EnergyWitness, we were able to verify the fix in seconds.
- With EnergyWitness, we were able to monitor the situation and discovered the problem was going to reoccur.
- With EnergyWitness, we had the proof we need to show the equipment required replacement.



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