The Mystery of the Disappearing Dispersant

How changing the chlorination schedule saved big bucks

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The System

- A large *spray pond* cooling system located in the desert SW
- Fairly low TDS, pH about 7.8
- Chem treatment: Zn, PO_4, TTA, chlorine, dispersant – *nothing exotic*
- Deep, clear water - >20 feet visibility
- Continuous sidestream filtration using sand filters
- In many ways, more similar to a large swimming pool than a typical cooling water system

The Dispersant

- Anionic co-polymer
- One of the most commonly used for over 20 years
- Sold by multiple suppliers
- Residual easy to measure using the Hyamine test
- *Again, nothing exotic*

The Problem

- The plant recently switched from a “non-ionic” dispersant which had no practical analytical method, therefore nobody really knew what the residual was
- Sample analysis for the new copolymer revealed rapid reduction in residual polymer: ~1 ppm per day
- At this rate, projections were > $50,000/mo for replacement chemical
- That’s $600,000 per year! ☹ which seemed like a lot of money back before the era of bailouts – don’t get me started!

The Investigation

- System blowdown was way too low to account for the loss of chemical – supported by no similar loss of other chemicals in the system
- No cationic products were in use (such as quat biocides), therefore no known issues with chemical compatibility
- The co-polymer is reportedly **highly resistant** to degradation by chlorine. I was told "Nick – you're barking up the wrong tree"

The Revelation

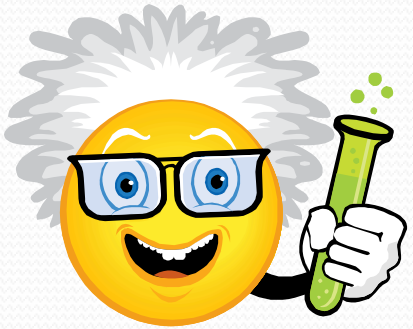
- Definition – a dramatic disclosure of something not previously known or realized

- It came to me while standing out by the spray ponds wishing I had put on some sun screen

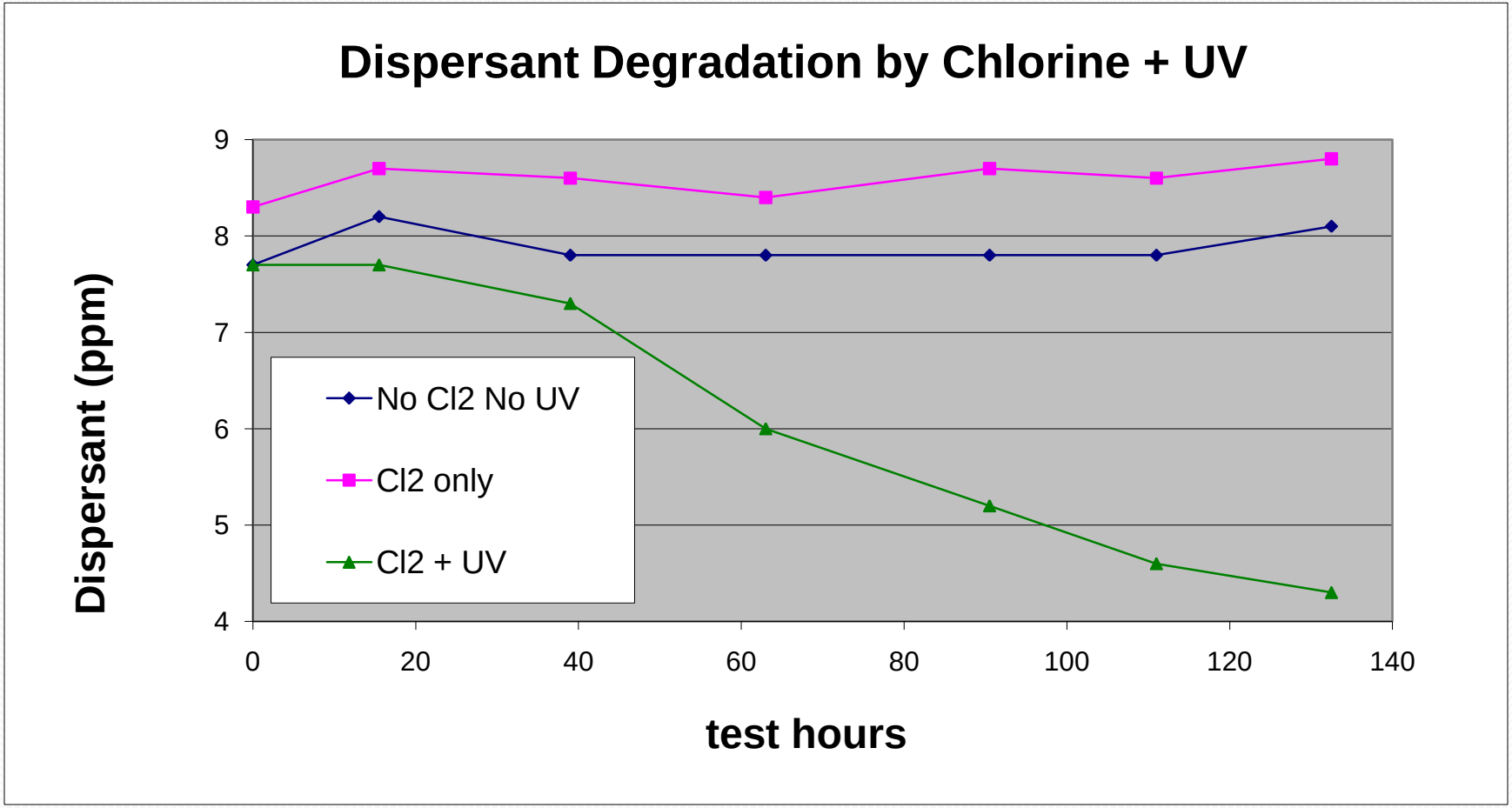
The Hypothesis

- What about chlorine and high UV intensity *simultaneously* ???
- Tests were designed to measure and compare the loss of dispersant when exposed to:

  1. chlorine only (indoors)
  2. both chlorine and UV (outdoors)
  3. no chlorine or UV (control)



Test Data

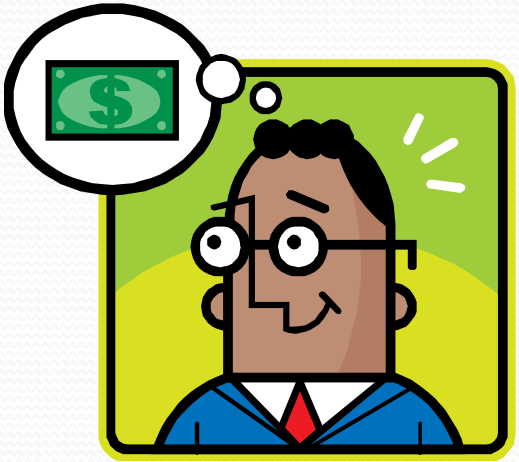

Dispersant Degradation by Chlorine + UV
Dispersant (ppm)
9
8
7
6
5
4
0
20
40
60
80
100
120
140
test hours
No Cl2 No UV
Cl2 only
Cl2 + UV

Recommendation

- Change the chlorination schedule from day shift to evening shift, after sun down
- The idea is to have several hours of contact time and chlorine degradation before the sun rises
- By the time the sun comes up, the chlorine would be essentially gone
- This recommendation was implemented right away

In-plant Results

- After changing to the night-time chlorination schedule, the dispersant degradation rate was reduced by over 90%
- This resulted in many fewer chemical additions, saving both dollars and manpower



General applicability

- Not many cooling water systems are exposed to such intense solar radiation because typical TSS (turbidity) is so high, the UV energy does not penetrate into the water very far.
- Cooling tower droplets are shaded rather than exposed to the sun like the spray of a spray pond.
- Therefore, this has limited general applicability, except:

Always question what the “experts” say and think outside the box!