Non-PFAS Wetting Agents for Decorative Chromium(VI) Plating

Paul Madden | SUR/FIN | June 2022

Agenda

1. Why convert away from PFAS?
2. Introduction of Chemistry
3. Introduction of Plating Lines
4. Conversion and Control
5. Testing emissions requirements
   - NESHAP and OSHA
6. Summary of results

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Why convert away from PFAS?

PFAS conversion

Goals

Why is the Cr(VI) plating industry so active in converting to non-PFAS mist suppressant products?

Increasing costs for pollution liability insurance

Uncertainty for the future

Potential for long term additional post-WWT costs

Availability of alternative and sustainable technology

Today, Atotech is uniquely positioned to help our customers in this transition. We are committed to the sustainable performance of the industries we serve, and we aim to lead the transition to more environmentally friendly plating technologies.

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

PFAS movements in United States

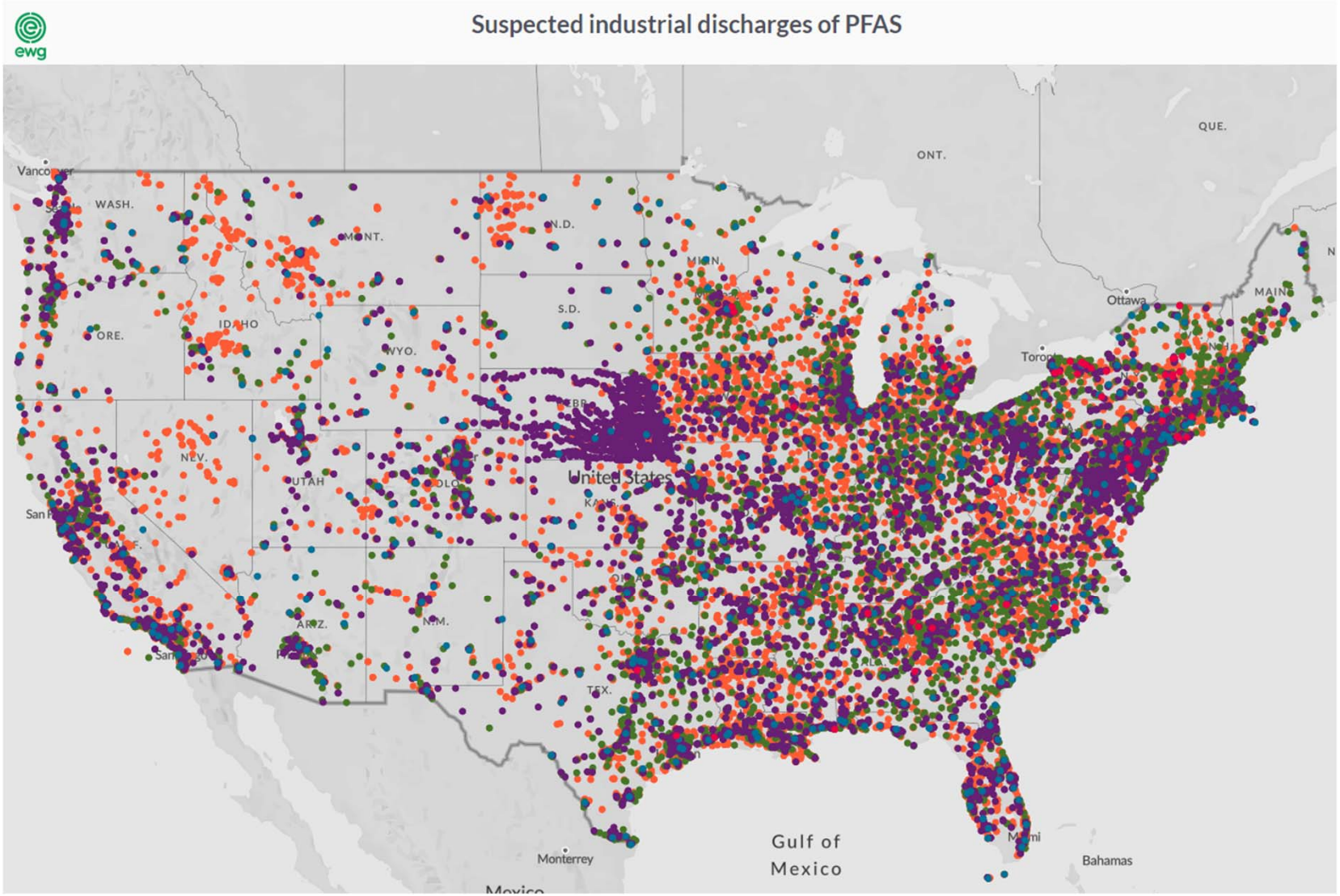
An ever-changing landscape

- In 2015 the plating industry transitioned away from long chain PFOS molecules to other shorter chain PFAS compounds
- Moving quickly to address through multiple statutes;
  - PFAS Action Act – currently with congress
  - PFAS Strategic Roadmap
  - Preliminary Effluent Guidelines Program Plan 15
- Through the lens of hindsight, shorter chain PFAS compounds are thought of today like PFOS was 2015. Viewed by many as a regrettable substitution.
  - The time is now for the industry to implement alternatives!

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

PFAS outlook going forward in USA

Things to watch



Source: https://www.ewg.org/interactive-maps/2021_suspected_industrial_discharges_of_pfas/map/

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

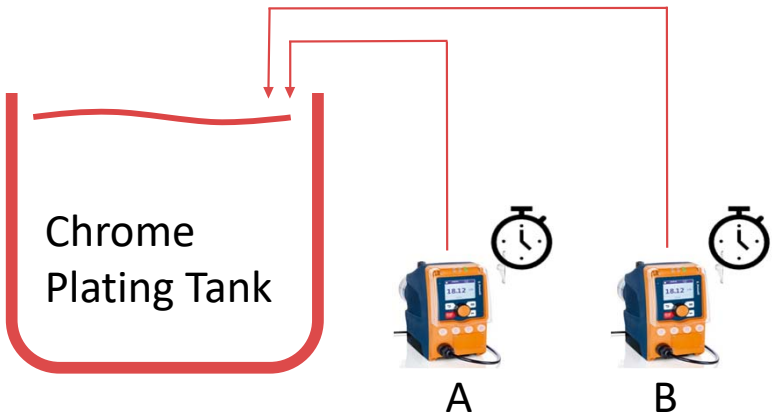
non-PFAS chemistry

For decorative tanks

non-PFAS chemistry for chrome plating

Dosing to the tank

- A non-PFAS based surfactant has been formulated for use in chrome baths
  - 2 component system which is added directly to the chrome bath
  - Both additives reduce surface tension
    - 1 additive forms foam blanket
    - 1 additive controls foam blanket characteristics
    - Ratio of 2 components can be tailored for each application
- Bath controlled by Surface tension and/or foam height
  - Fully converted bath operates around 40-45 dynes
- Material breaks down with time and causes no negative impact to bath performance
  - Dosed by time, not amp*hour



© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Case studies

Converted plating lines

Plating line case study

Bolta US

- Bolta US is Decorative Automotive Plater
- Plating line capable of 700k – 1M m^2/year
- Five chrome tanks
  - Each tank is approximately 9,000 liters (~2,400 gallons)
- Produce multiple finishes across multiple parts
  - Bright and Satin Nickel
  - Interior and Exterior parts
- Slide conversion of tanks
- Methods of demonstrating compliance;
  - Surface tension
  - Exhaust scrubber
- Worked with ADEM and EPA Region 4

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line conversion

Bolta US

- Customer discontinued additions of PFAS containing wetting agents to decorative chrome tanks.
- Decorative tank's surface tension allowed to increase to 40 dynes before conversion began
  - This was done to reduce interaction of old and new processes
- Began dosing new system into the bath once surface tension increased to 40 dynes
- Adjusted feed rates in initial weeks while material transitioned
- Monitored continuously for surface tension, foam formation, and foam height

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line conversion

Bolta US

Comparing control methods

PFAS bath

non-PFAS bath

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line case study

Allied Finishing

- Allied Finishing is Automotive Decorative Plater
- Plating line capable of ~50,000 m^2/year
- Three chrome tanks
  - Chrome tanks are 5,000 liters (~1,300 gallons) each
- Produce Bright Nickel parts for Automotive industry
- New Make up of one tank
- Slide conversion of other tanks online
- Methods of demonstrating compliance;
  - Surface tension
  - Exhaust scrubber
- Conversions/Permits;
  - Worked in close cooperation with MI EGLE

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line conversion

Allied Finishing

- Allied Finishing made up 1 new chrome tank
- Started production with new non-PFAS wetting agent
- Monitored continuously for surface tension, foam formation, and foam height

- Customer discontinued additions of PFAS containing wetting agents to the remaining Decorative chrome tanks.
- Decorative tank surface tension allowed to increase to 40 dynes before conversion began
  - This was done to reduce interaction of old and new wetting agent

- Began dosing new system into the baths once surface tension increased to 40 dynes
- Adjusted feed rates in initial weeks while material transitioned
- Monitored continuously for surface tension, foam formation, and foam height

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line conversion

Allied Finishing

Comparing tanks

New non-PFAS bath

Slid non-PFAS bath (2 weeks after slide)

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line case study

North Star Plating

- North Star Plating is an after-market decorative Automotive plater
- Plating line capable of ~120,000 m^2/year
- One 5,700 liter (~1,500 gallons) chrome tank
- Produce Bright Nickel parts for Automotive industry
- Slide conversion of single tank
- Operates WITHOUT an exhaust scrubber
- Methods of demonstrating compliance;
  - Surface tension
- Conversions/Permits;
  - Worked with MPCA and EPA Region 5

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line conversion

North Star Plating

- North Star Plating discontinued additions of PFAS containing wetting agents to the Decorative chrome tank.
- Decorative tank surface tension allowed to increase to 40 dynes before conversion began
  - This was done to reduce interaction of old and new processes
- Began dosing new system on top of bath once surface tension increased to 40 dynes
- Adjusted feed rates in initial weeks while material transitioned
- Monitored continuously for surface tension, foam formation, and foam height

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line conversion

North Star Plating

Comparing control methods

- PFAS containing bath

0 seconds

30 seconds

90 seconds

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Plating line conversion

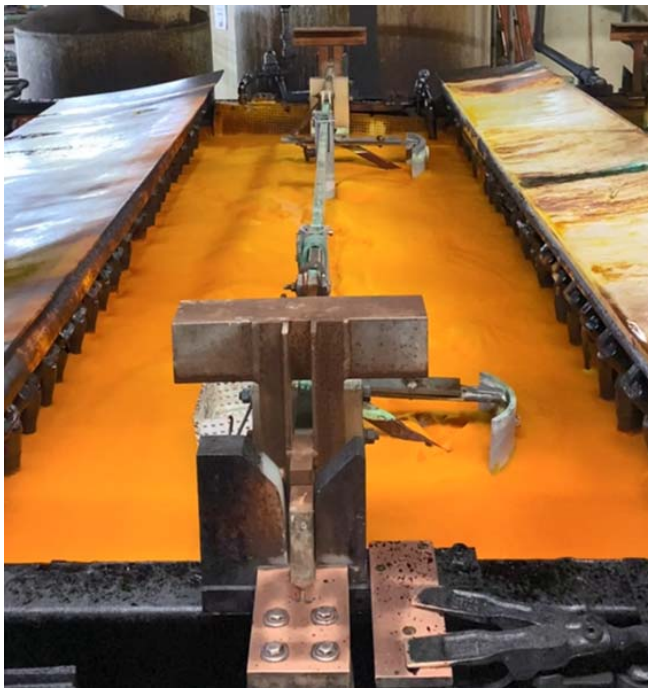
North Star Plating

Comparing control methods

- Non-PFAS bath

0 seconds

30 seconds



90 seconds

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Conversion and testing

Eliminating PFAS

Plating line conversion

Eliminating PFAS

- Prior to any conversion, the customer's air permits were reviewed
  - Determine if permit modification is required
- Dialogue with the local EPA region (if required)
- Permit modification proposal sent to local EPA region (if required)
- Dosing equipment and chemistry coordinated
- Stack test for permit modification scheduled (if required)
- Start conversion
  - Site-specific surface tension and/or foam height and/or scrubber exhaust
- After reaching steady state perform stack test and PEL test
- Communicate results and site-specific control method to local EPA region
- New permit issued

Continue plating now without PFAS!

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Emissions testing

EPA & OSHA compliance

Emissions testing

Help provide safe operation

Due to transition of the decorative chrome bath to an elevated surface tension of 40-47 dynes, a new air permit was required in all 3 case studies. To re-permit a Method 306 Stack test was required to demonstrate compliance.

- All 3 lines passed the chrome exhaust emissions requirement for their region

Additionally, an OSHA Personal Exposure Limit (PEL) test for chromium was also undertaken to ensure safe conditions for line operators.

- All 3 lines passed the exposure limits required as well.

Customer	% of Stack Test	% of PEL test
Bolta US	<20% of limit	<15% of limit
Allied Finishing	<10% of limit	<15% of limit
North Star Plating	<15% of limit	<15% of limit

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Summary

Conclusion of case studies

Summary

Transitioning to PFAS free

Customers have been pleased with the transition away from PFAS based wetting agents.

No longer purchasing and bringing PFAS into their facility

- Essentially turning off the PFAS tap

Facilities passed stack test Method 306 and OSHA Personal Exposure Limit.

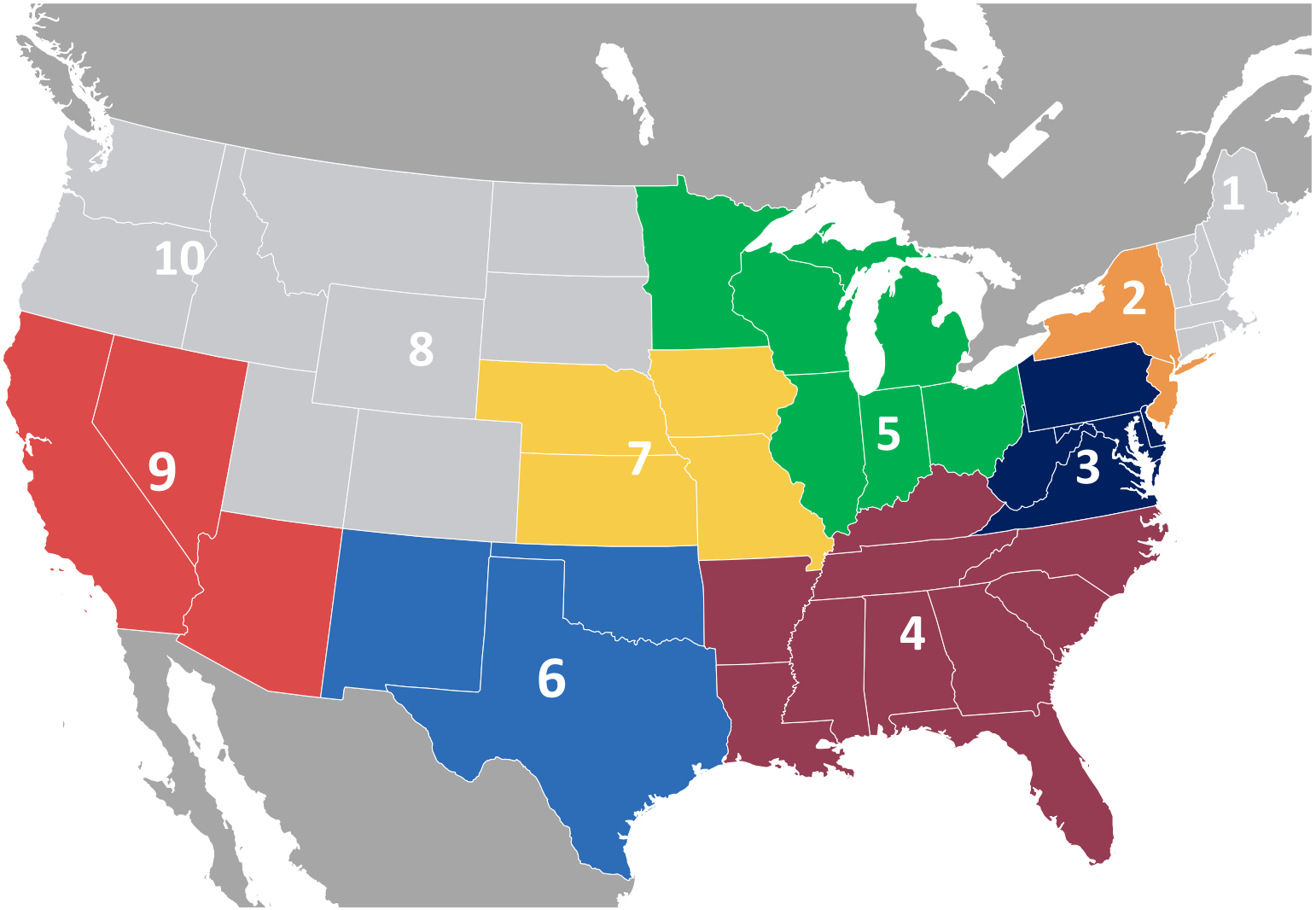
Have or working towards new permit from regulators allowing for production by site-specific surface tension, site-specific foam height, by exhaust scrubber or some combination.

- No longer a part of the continued-use PFAS debate
- Converted customers in EPA regions 2, 3, 4, 5, 6, 7 and 9

The pathway from PFAS based wetting agents is available and can allow chrome platers to stop introducing this chemical of concern into their facility.

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Conversion started across numerous EPA regions



© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022

Thank you

for your attention!

Regional Headquarters

Atotech USA LLC
1750 Overview Drive
Rock Hill, SC 29730

info@atotech.com
www.atotech.com

Visit us at Booth 112!

© Atotech | SUR/FIN – non-PFASWetting Agents – Rosemont, IL USA – 06/2022