

Modern pretreatment processes

Sylvain Masson | Global Product Manager

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Modern pretreatment processes

Importance of cleaning



Cleaning is the essential first step for all pretreatment processes. Removal of all soils, whether organic or inorganic, is imperative for the highest final part quality

Improper and/or incomplete substrate cleaning results in:

- Visual paint defects
- Poor adhesion of plated metal, paint or enamel

Poor corrosion resistance

- Neutral Salt Spray (NSS)
- Cyclic Corrosion

Rejects lead to costly rework and production inefficiencies

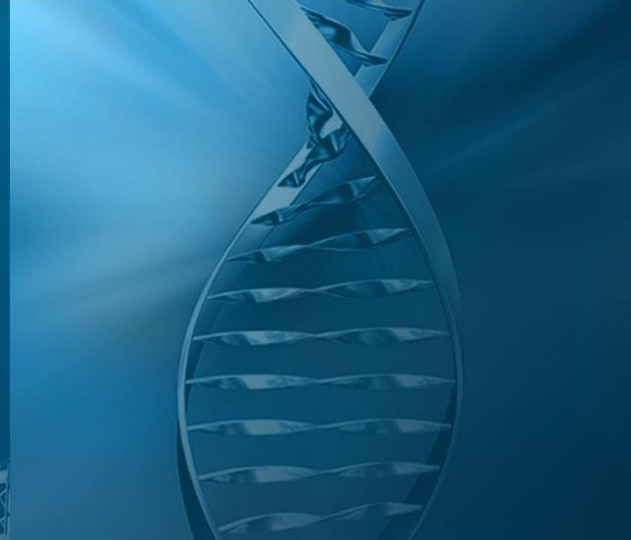
Organic soil



Inorganic soil



Organic soil removal



Modern pretreatment processes

Cleaning and degreasing



Alkaline cleaning – probably the most universal metal finishing step



Despite a perception that “soap is soap”, proper cleaning is essential to painting processes



Cleaner choice, performance, and operation has a large impact on the overall surface finishing process



Modern pretreatment processes

Conventional cleaners



Conventional alkaline cleaners are capable of removing many organic soils but have many process disadvantages, including:

- High operating temperatures (60 – 80 °C)
- High energy costs
- Very short solution life

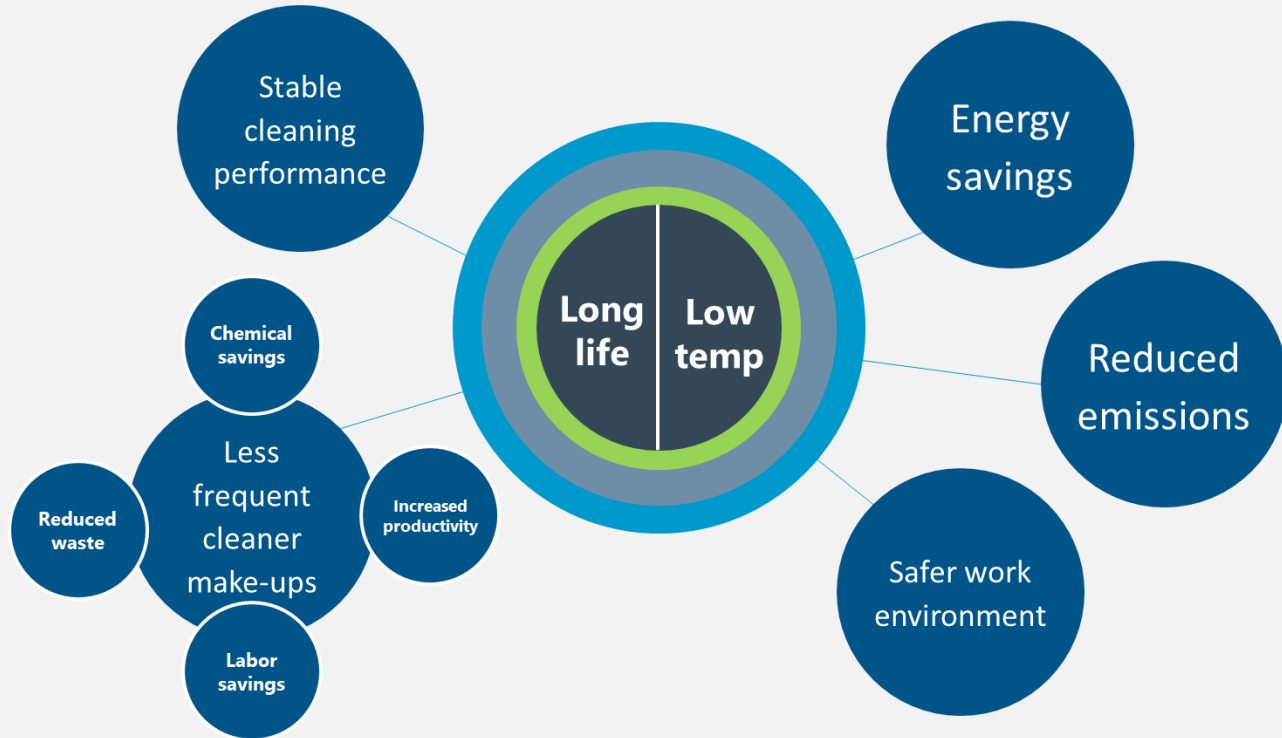


As organic soils are removed from the substrate surface, they become emulsified in solution, leading to the gradual decrease in cleaning performance until the solution must be replaced



Modern pretreatment processes

Achieving long life and low temperature cleaning



Modern pretreatment processes

UniPrep® - long life low temperature cleaners



UniPrep® long life, low temperature cleaners support the natural degradation of the organic soils removed from substrate surfaces during the degreasing process, creating a more sustainable process than conventional cleaners



By achieving this, UniPrep® provides the following benefits as compared to conventional alkaline cleaners:

- Less frequent cleaner dumps/make-ups
- Easy to waste treat
- Low operating temperatures



Modern pretreatment processes

UniPrep® - long life low temperature cleaners



Low operating temperature results in substantial energy savings and greatly improved carbon footprint

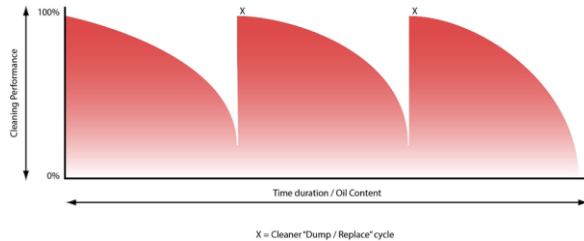


Long life solution supports increased productivity, chemical consumption and wastewater treatment savings. With UniPrep®, a 2X cleaner life is achievable in nearly every application with further bath life extension possible with support from auxiliary like UniPrep® ISOtect



Maintains stable performance throughout cleaner life

Conventional cleaner



Modern pretreatment processes

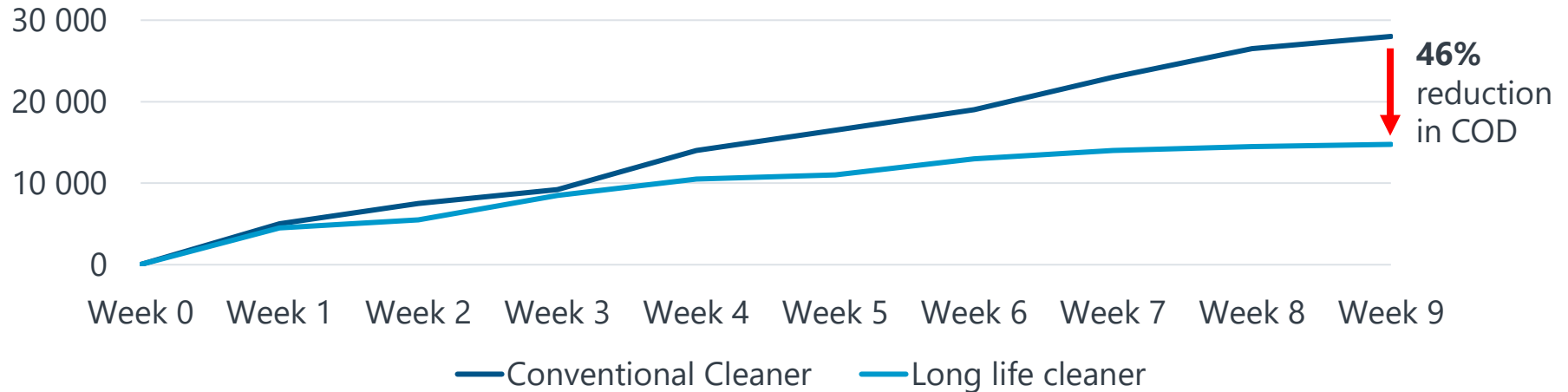
UniPrep® - long life low temperature cleaners



Reduced Chemical Oxygen Demand (COD) levels

- COD measures the content of organic compounds in solution, such as the soils removed during the cleaning process

Chemical oxygen demand

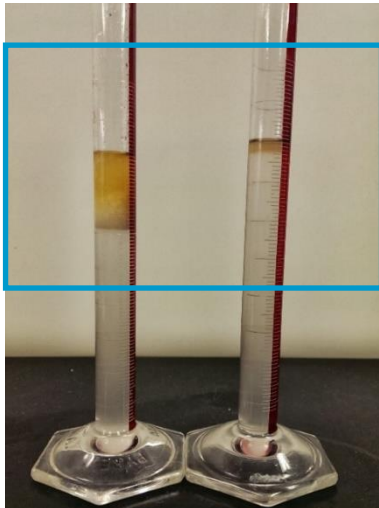


Modern pretreatment processes

UniPrep[®] - long life low temperature cleaners

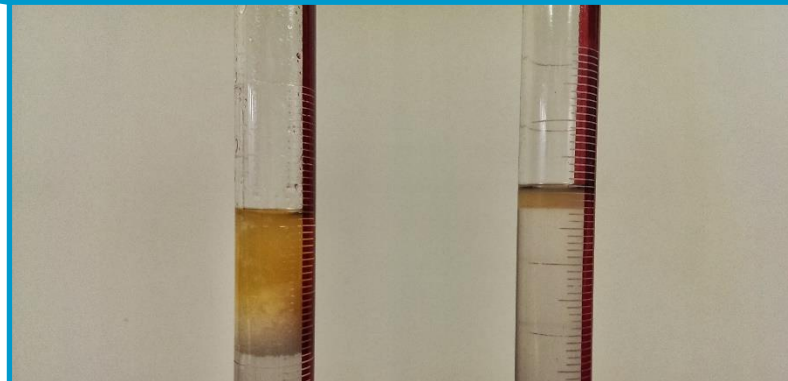


Evaluations of a conventional cleaner versus UniPrep[®] long life cleaner exhibit the ability to reduce oil content in the cleaning solution by as much as 7X



Conventional cleaner

UniPrep[®] cleaner



Conventional cleaner

UniPrep[®] cleaner

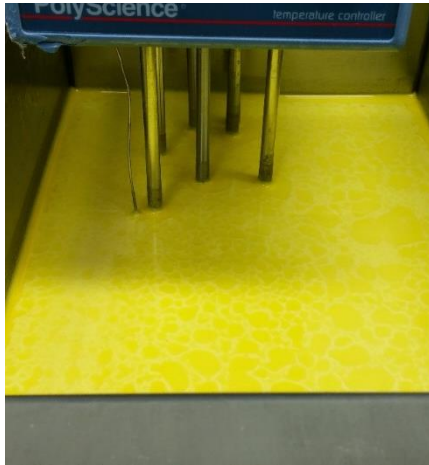
Modern pretreatment processes

UniPrep® - long life low temperature cleaners



When a cleaner is fully saturated with oil, it can no longer emulsify more oil. Evaluations of a conventional cleaner versus UniPrep® long life cleaner exhibits how reduced unsaturated oils can support extended solution life

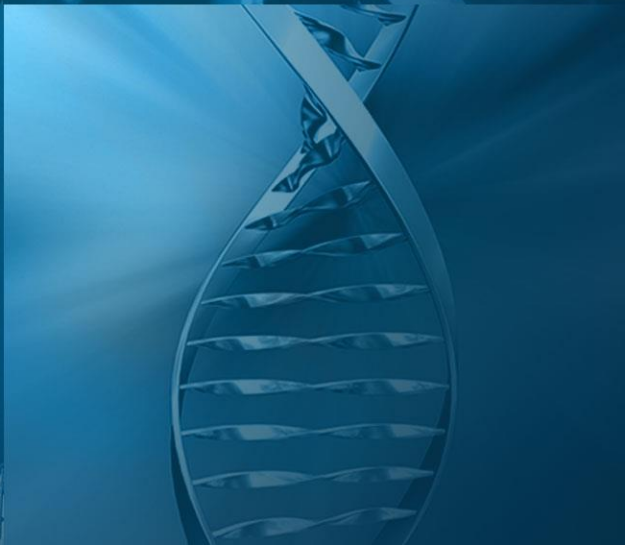
Conventional cleaner



UniPrep® cleaner



Auxiliary
equipment:
UniPrep[®]
ISOtect



Modern pretreatment processes

UniPrep® ISOtect



Auxiliary equipment is often used in cleaning and degreasing applications where high oil loading of the cleaner is observed; it can help extend the usable life of the chemistry, but can be maintenance intensive and generates a secondary waste stream



The UniPrep® ISOtect equipment was designed to further support the natural degradation of organic soils for extended solution life



UniPrep® ISOtect is unique in that there is no additional waste generated typical of alternative oil removal equipment



Modern pretreatment processes

UniPrep® ISOtect



Application

Tank volume (m³)

Previous cleaner bath life

UniPrep® bath life

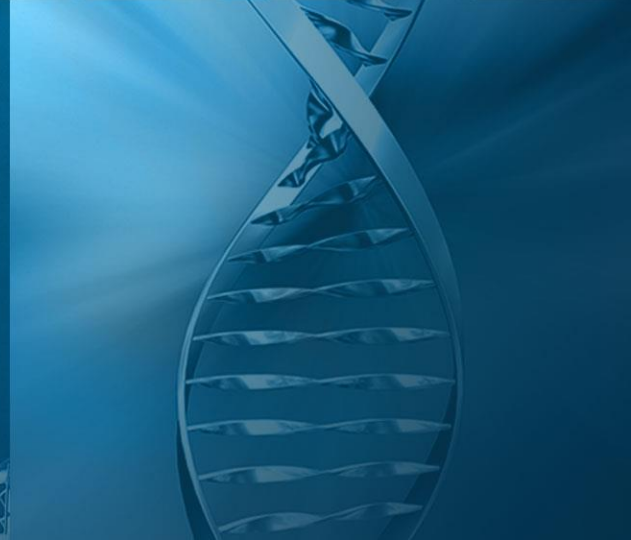
Bath life extension

Customer 1	1.5	1 month	> 3 years	> 36X
Customer 2	5.0	1 month	> 3 years	> 36X
Customer 3	0.5	4 months	> 3 years	> 9X
Customer 4	5.0	2 months	> 2 years	> 12X
Customer 5	2.0	6 months	> 2 years	> 4X
Customer 6	3.0	1 month	> 3 years	> 36X
Customer 7	3.0	1 month	> 2 years	> 24X
Customer 8	4.0	6 months	> 2 years	> 4X
Customer 9	3.0	1 month	> 2 years	> 24X



These customers, serving multiple industries including automotive, fasteners and general industry, have attributed many savings and process improvements with implementation of UniPrep®, including less rejects, longer bath life of other chemical stages and in each case a >50% reduction in oil content in the cleaner solution

Inorganic soil removal

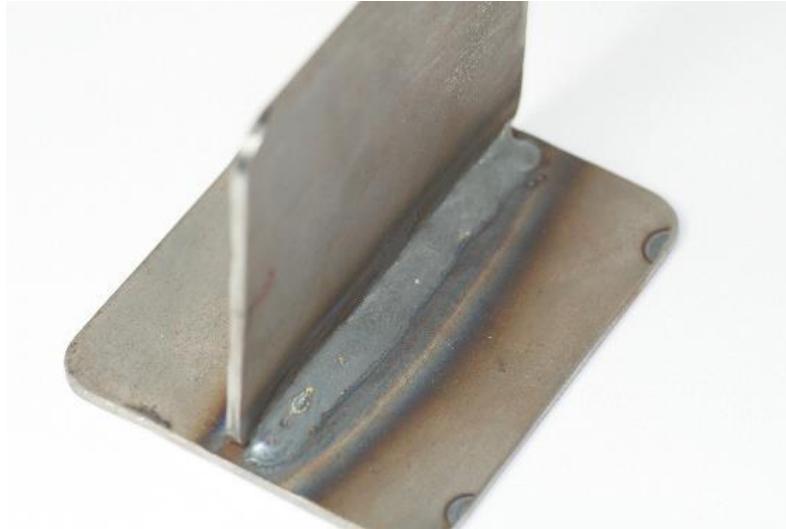


Modern pretreatment processes

Inorganic soil removal



Inorganic contaminants are typically observed as oxides, rust or scale. They can form naturally, from environmental exposure or from mechanical operations like welding or laser cutting



Modern pretreatment processes

Inorganic soil removal



Much like organic contaminant, inorganic soils can equally prevent proper deposition of subsequent plating, conversion coating or passivation steps and compromise the finished part



Modern pretreatment processes

Weld and laser scale

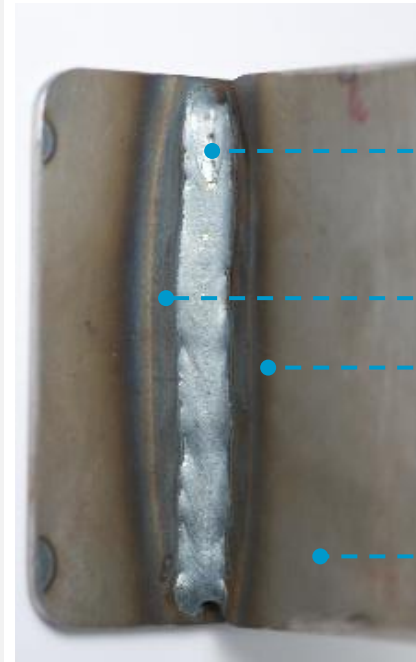


Laser

Laser cut scale on edges



Weld



Weld seam
with silica

Weld burn / heat
affected zone

Metal substrate

Modern pretreatment processes

Weld and laser scale

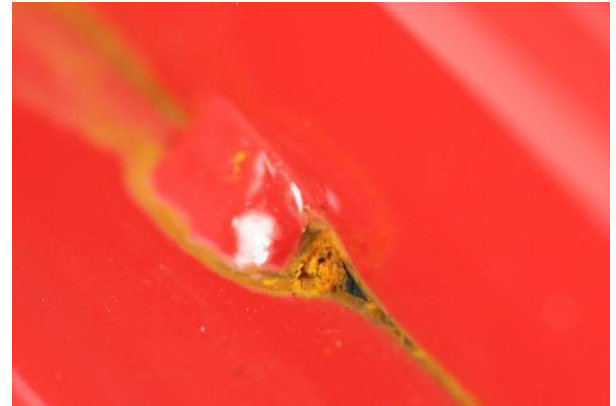


The removal of oxide and scale prior to coating is frequently ignored or considered too challenging



As a result, welds and laser cuts are often the first point of failure

- The scale formed during these processes prevents organic coatings (ecoat, wet paint, powder paint) and inorganic coatings (plating) from properly adhering to the substrate surface
- Traditional alkaline cleaners/degreasers are incapable of effectively removing weld or laser scale



Modern pretreatment processes

Weld and laser scale



The most economical option for oxide/scale removal is in the paint pretreatment process:

Avoids the labor and safety costs of mechanical descaling

- Media blasting requires higher capital investment and short equipment life
- Grinding requires labor and creates injuries

Can minimize the necessity and cost of inert atmosphere laser cutting

- Expensive capital investment, can still generate oxides if operated improperly

Strong acid descalers are limited to immersion applications

- Safety concerns
- Short equipment life

Extra stages for either immersion and spray applications require a relatively small capital investment and low operating costs

- Easily achieved for new line builds
- Possible in existing lines if the factory has the floor space



Modern pretreatment processes

Weld and laser scale



UniPrep® AC processes are designed for ferrous weld and laser descaling

Operate at near neutral pH, resulting in less substrate etching which leads to process savings through longer solution life and lower WWT costs

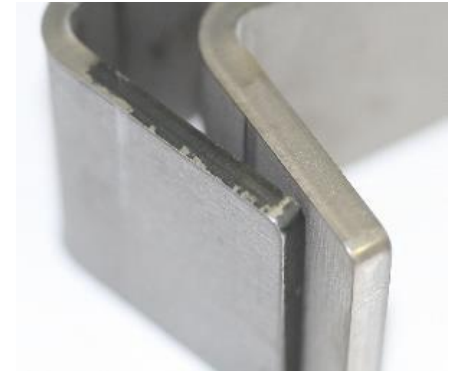
Special surfactant additives allow for cleaning + descaling in one step, ideal for existing lines with limited chemical stage capacity

Minimized risk of flash rusting

Free of strong acids such as phosphoric acid and fluoride compounds

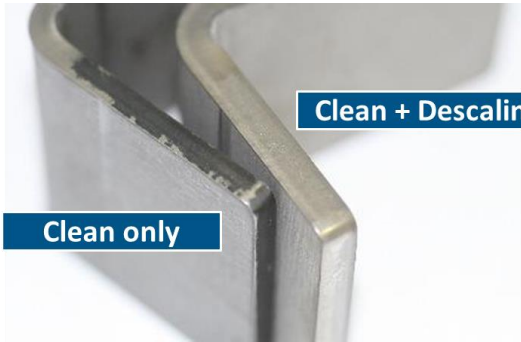
Reduced etch rate versus conventional strong acid chemistries

Eliminates risk for hydrogen embrittlement

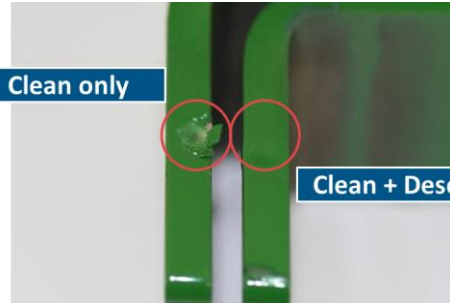


Modern pretreatment processes

Weld and laser scale



Clean + Descaling



Clean + Descaling



Clean + Descaling

Modern pretreatment processes

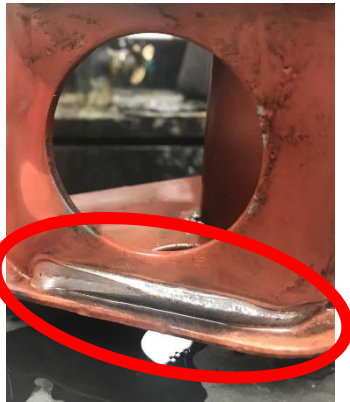
Weld and laser scale



The most efficient and quick way to evaluate and compare the removal of scale for steel substrates is to immerse the part in an auto-deposition copper solution

- A clean surface leaves a bright, consistent and adherent deposit when wiped with a tissue
- Quickly exhibits whether production plating, conversion coating or paint will perform well

No descaling



Incomplete descaling



Complete descaling



Modern pretreatment processes

Weld and laser scale



The most efficient and quick way to evaluate and compare the removal of scale for steel substrates is to immerse the part in an auto-deposition copper solution

- A clean surface leaves a bright, consistent and adherent deposit when wiped with a tissue
- Quickly exhibits whether production plating, conversion coating or paint will perform well

As received



Clean only



Clean + descale



Notable elimination of "burn areas" which typically require manual grinding

Modern pretreatment processes

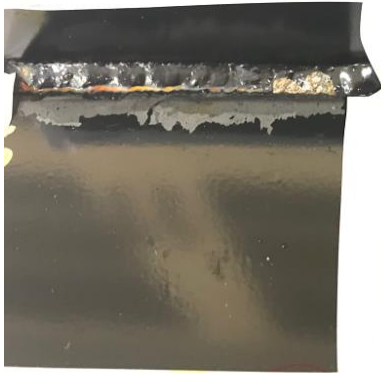
Weld and laser scale



Paint evaluations are the most effective indicator for descaling performance, but not always the most efficient or timely. Corrosion testing is the most indicative test for descaling performance but is the lengthiest test

Part before and after near neutral descaling – Cathodic epoxy ecoat and NSST

Clean only (336 hours)



After descaling (840 hours)



Modern pretreatment processes

Weld and laser scale



Paint evaluations are the most effective indicator for descaling performance, but not always the most efficient or timely. Corrosion testing is the most indicative test for descaling performance but is the lengthiest test

Heat affected area NSS performance (1,050 hours)

Clean only



Non-burn area

Burn area

After descaling



Modern pretreatment processes

Weld and laser scale



Paint evaluations are the most effective indicator for descaling performance, but not always the most efficient or timely. Corrosion testing is the most indicative test for descaling performance but is the lengthiest test

- Using their existing pretreatment, an automotive OEM implemented chemical descaling to improve weld corrosion
- Existing process exhibits red rust after 1 year simulated cyclic corrosion, implementation of descaling does not exhibit red rust until to 3 years simulated cyclic corrosion
- Reduced corrosion depth at the weld by 44%

**Cyclic corrosion = 50 cycles
(1 year)**



**Existing pretreatment
(no descaling)**



**Existing pretreatment
+ chemical descaling**



Thank you!

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