

Troubleshooting Corona Treatment Issues

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Abstract

Time is money. But much more so a down production line in an increasingly competitive global economy. This paper presents critical troubleshooting and preventative maintenance advice to get corona treating equipment back on-line quickly to generate value-adding product for converting lines. Possible maladays such as backside treatment and surface over-treatment will also be addressed.

Extended Abstract

How much does it cost per minute for your production line to be down? Although a quick estimate of lost material production is somewhat simple in terms of downtime multiplied by standard throughput, most production personnel are not privy to direct, indirect, overhead and other costs also attributable to a downed production line. Every minute of downtime not only directly impacts the profitability of the job being run, but it also delays subsequent projects which can jeopardize future business.

Because these costs are frequently understated, having troubleshooting information for component systems on production lines such as corona treaters can help mitigate these costs. A review of corona treater instruction manuals, power supply diagnostics, diagnostic options and the supplier's support structure is a necessary "101" course for production line operators in preparing for potential treater issues.

After having operators review all available troubleshooting information, where do you go from there? Having this information readily available for access by operators, as well as having all operators trained in the protocols associated with a down treater is key.

When a line is down due to a treater issue, a check of the diagnostic indicators on the power supply is a first step. Having the instructional manual, the supplier service number, and a link to on-line troubleshooting are immediate sources for power supply issues. One typical issue can include high temperature fault indications. When this happens, a check of heat sink to ensure they are clean and operating, and that the thermal switch closes normally. When treater station fault indications are noticed, station faults such as a lack of airflow may indicate a blower is not operating. An electrode may also not be in treat position, or the treater roll has stopped rotating.

Preventative maintenance is key to preempting issues arising with surface treaters. Regular cleaning of bare and covered dielectric ground rolls, as well as the cleaning of electrodes and inspection of exhaust airflow and air gaps, will ensure peak discharging. Controlling ozone by ensuring blower efficiency through the regular cleaning of the exhaust plenum will also prevent downtime due to ozone migrations from the treater.

A typical corona treater is designed to produce a corona in the air gap between the high voltage electrode and the ground roller. The occurrence known as backside treatment is the result of a corona being produced on both sides of the web even though the treating system is only intended to treat one side. The resulting undesired treatment on the backside of the web can result in blocking and picking. It may also cause an insufficient treat level on the side of the web requiring treatment, since some of the power intended for treating the web was delivered to the opposite side, thus reducing the watt density provided to the side to be treated. There are a

number of causes for backside treatment, all of which are a result of air being entrained under the web being treated. One of the most common causes for backside treatment is dirt build-up on the roll. Another cause of backside treatment is due to the increase in line speeds. As webs exceed 600 fpm production speeds, boundary layers of air traveling with the web develop. These boundary layers of air can cause the web to float over the ground roll, resulting in air underneath the web. This air ionizes in the gap, producing backside treatment. The use of nip rolls at low nip tension tends to break up any boundary layer air traveling with the web. The use of treater roll coverings made from organic materials such as epoxy or rubber can also cause backside treatment as the covering begins to deteriorate from the heat, ozone and UV exposure produced in the corona process. This problem can manifest itself when running different web widths as a visible pattern of the different webs begins to appear on the roll. Wrinkles are also another cause of backside treatment. The most common method of eliminating wrinkles is with spreader or stretcher rolls. Roll realignment, readjusting web tension, extending the web wrap, improving gauge control and managing static are also key approaches to wrinkling problems which emerge.

Another issue which can affect the performance of converted product is overtreatment. This kind of issue can most readily be gauged between real time production periods through the use of dyne markers or solutions. Overtreatment can have a direct impact on adhesion, and specifically with regards to heat sealability. If undertreatment materializes, a key suspect is resin blend which can involve variations in quantities of slip or anti-block additives. These may require higher power levels to achieve the same dyne level. If you are already at maximum power, reducing speed will allow you to determine the need watt density required to get to your dyne level. Try a different batch, preferably one you know has worked in the past. If you treat it successfully using the target watt density, the substrate has changed. If another treater is available, try using it at the target watt density. If the treater is suspected to be causing undertreatment, check the ground brushes for appropriate contact. If the brush is failing, it is possible to develop a corona in the bearing which will rob power needed for treating. Also check the high voltage wiring from the high voltage transformer to the electrode for a loose connection in an area of the wire which comes too close to the ground. If the wire is too close to the ground, it may develop a corona between the wire to the ground. This will also rob power from where you want it.

Intermittent testing of surface energy during production can preclude long durations of line treater inspections, downtime, and expensive material scrapping down the road.

This paper recommends that a treater system audit be conducted on a basis concurrent with maintenance schedules. System audits include inspections of power supplies, station components and the high voltage transformer. An outline of system checks can be provided by the treater manufacturer and integrated into maintenance procedure manuals and protocols. A treater company service engineer can also be solicited to perform on-site audit activities with maintenance staffs to bring treater performance back to standard levels, as well as advise new station components, including software and hardware, to enhance new treater capabilities.

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Troubleshooting Corona Treating Equipment on Film Extrusion Lines

Presented by:



Rory A. Wolf

Enercon Industries Corporation

Troubleshooting/Maintenance

- Troubleshooting
- Preventive Maintenance
 - Cleanliness
- Backside Treatment
- Over Treatment



How much does it cost per minute for your line to be down?

LINE DOWN

Where do we start?

- **1. Before You Purchase**
 - **Review Instruction Manual**
 - **Review Power Supply Diagnostics**
 - **Review Other Diagnostic Options**
 - **Review Supplier Support Structure**

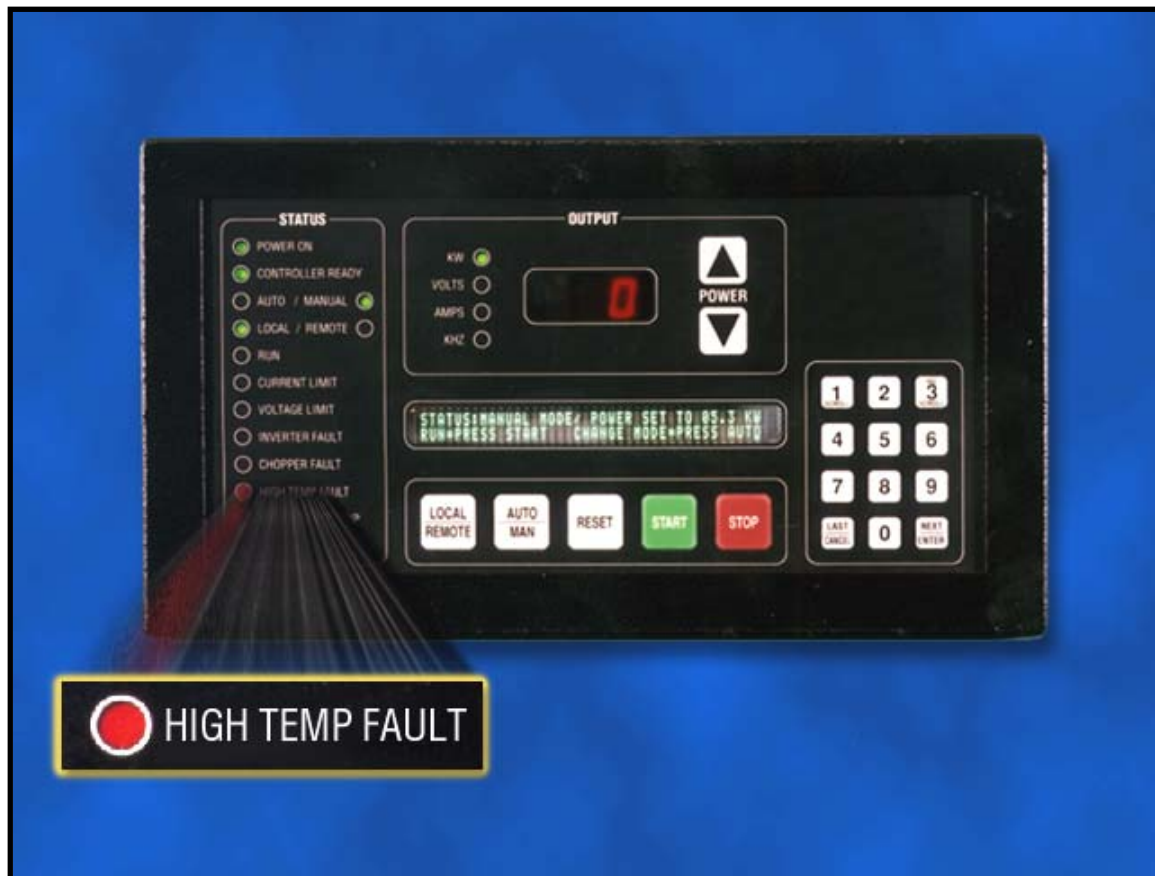
Where do we start?

- **2. At time of LINE DOWN incident**
 - **Check diagnostic indicators on Power Supply**
 - **Have instruction manual available**
 - **Have supplier service number available**
 - **Determine if internet on-line assistance is available**

Power Supply Control Panel



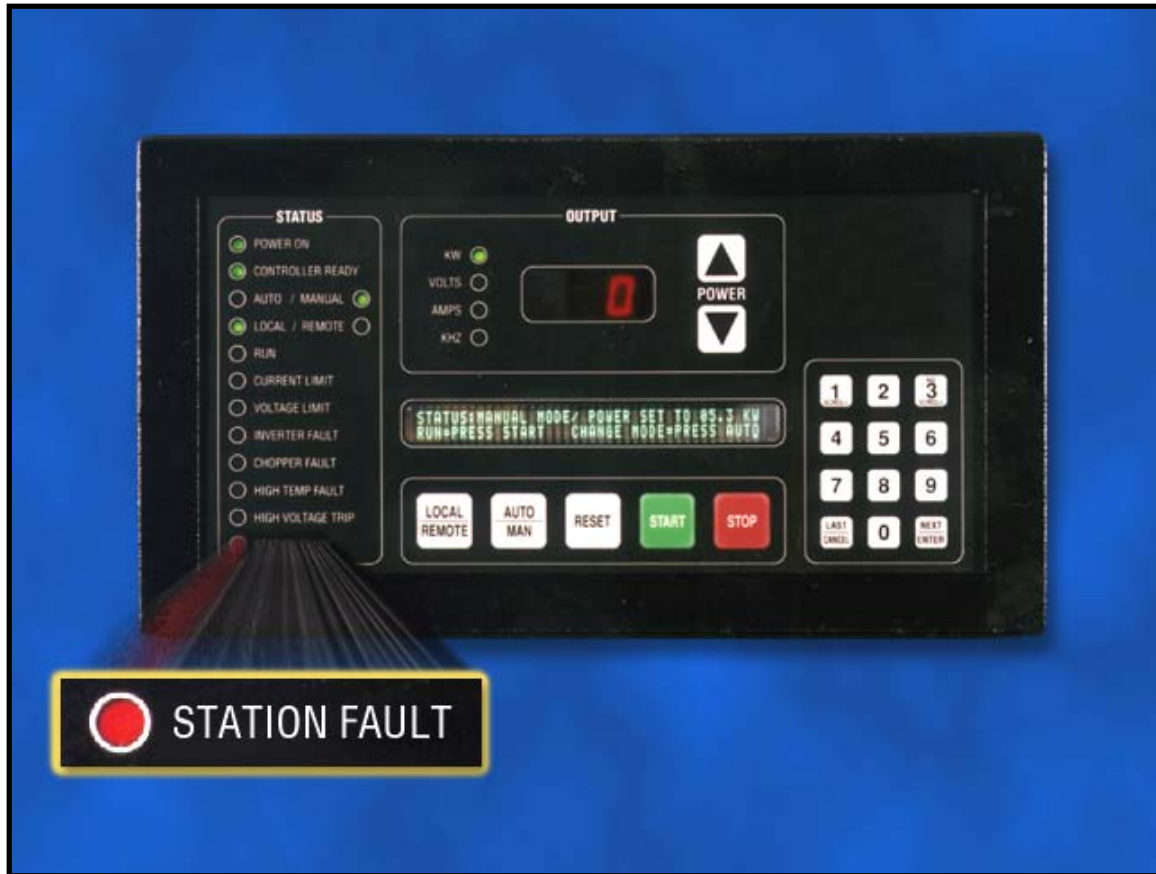
High Temp Fault Indication



High Temp Fault Checks

- **Heat Sink Fans operating?**
- **Heat Sink Fans clean?**
- **Thermal Switch normally closed?**

Station Fault Indication



Station Fault Checks

- **Air Flow: Is blower operating?**
- **Electrode Interlock: Is electrode in treat position?**
- **Zero Speed: Has line stopped or treater roll stopped rotating?**

Troubleshooting/Maintenance

- Troubleshooting
- Preventive Maintenance
 - Cleanliness
- Backside Treatment
- Over Treatment

Preventive Maintenance & Cleanliness

- **Rolls**
- **Electrodes**
- **Exhaust System**



Roll Maintenance

- Bare – Roll
- Covered - Roll



Dirty Roll





Preventive Maintenance & Cleanliness

- Rolls
- **Electrodes**
- Exhaust System



Electrode Maintenance

- **Assembly**
- **Air Flow**
- **Air Gap Adjustment**

Air Gap Adjustment Procedure

Surface Treating Stations Electrode Air Gap Adjustment - Enercon Industries Corporation - Microsoft Internet E...

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Address <http://www.enerconind.com/support/treating/stations/gapadj.html> Go Links >>

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Electrode Air Gap Adjustment Surface Treating Stations

Problem Incorrect air gap adjustment causes uneven treatment and may lead to damaged electrodes.

Solution

I.	Adjust the electrode air gap. (Refer to Correctly Adjusted Electrode Assembly)
A.	Loosen the electrode locking screw located at each end.
B.	Adjust the electrode air gap. The factory recommended gap is 0.060"
C.	Tighten the electrode locking screws.
II.	Adjust the electrode assembly pitch. (Refer to Correctly Adjusted Electrode Assembly)
A.	Loosen the lock nut on the electrode tilt adjust bolt.
B.	Adjust the bolt as necessary to correctly align the air gap for each electrode in the assembly.

Done Internet

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Electrode Air Gap Adjustment Surface Treating Stations

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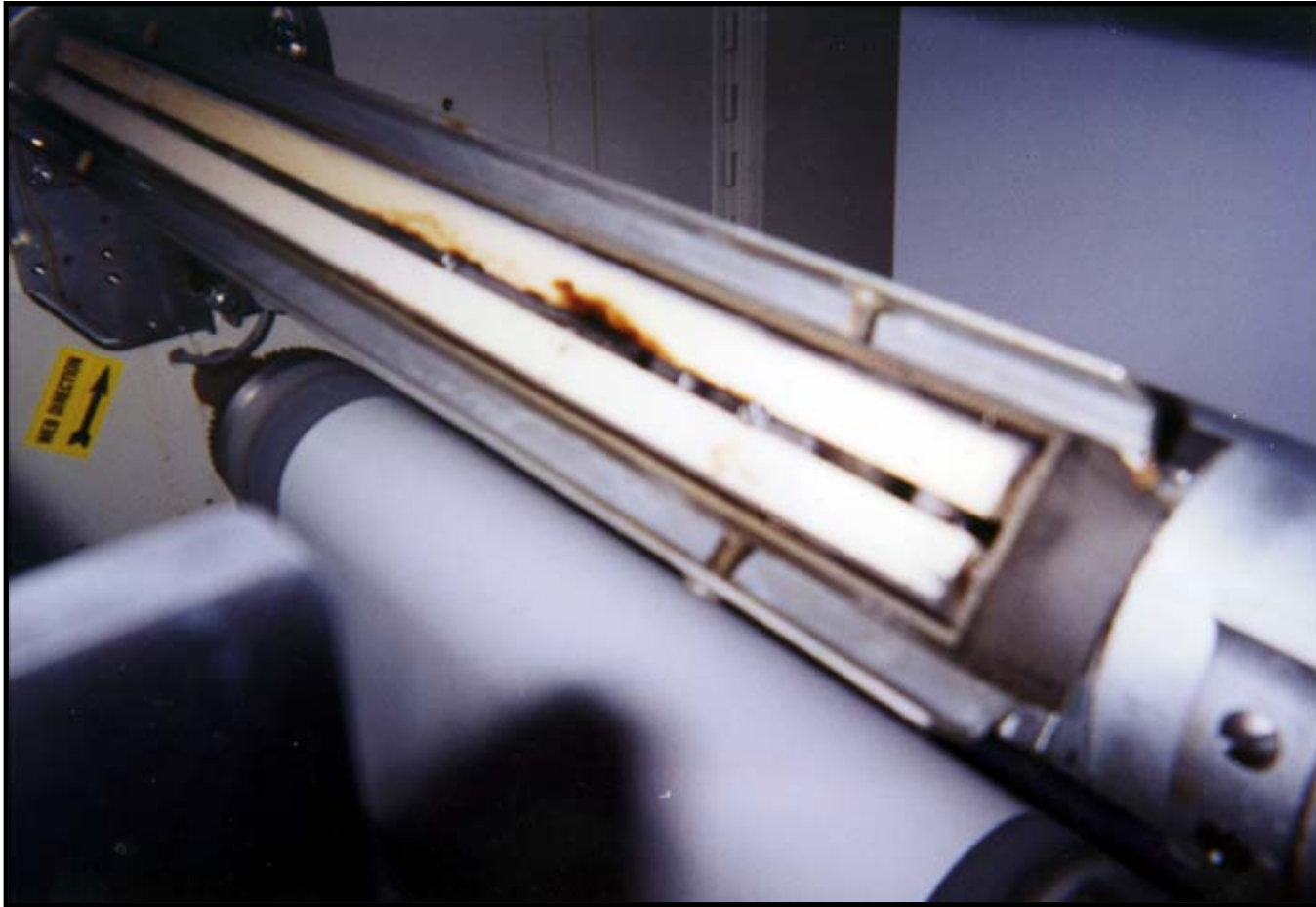
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B.	Adjust the bolt as necessary to correctly align the air gap for each electrode in the assembly.

Done Internet



Dirty Electrode





Electrodes will not pivot freely

The screenshot shows a Microsoft Internet Explorer browser window with the following details:

- Title Bar:** Electrode Assemblies Assemblies Will Not Pivot Freely - Enercon Industries Corporation - Microsoft Internet Expl...
- Address Bar:** http://www.enerconind.com/support/treating/stations/pivot.html
- Navigation Menu (Left):** Contacts, Company Resume, Surface Treating, Induction Sealing, Technical Support, What's New!, Newsletters, Employment, Home.
- Main Content Area:**
 - Section Header:** The Electrode Assemblies Will Not Pivot Freely
 - Symptom:** The electrode assemblies don't pivot freely which results in broken electrodes or the electrode assembly has to be moved back into the treat position.
 - Fault:** There are a few possible causes for this problem.
 - Solutions:**
 - I. The collar which provides the electrode position indication for the interlock circuit is binding at the bearing housing. ([Item 7](#))
 - Note!** The collar is on both ends, but the interlock switch is only installed on one end.
 - A. Loosen the 3 sets of screws and reposition the collar away from the bearing housing.
 - B. Ensure the interlock functions properly when repositioned.

The screenshot shows an Internet Explorer browser window with the following elements:

- Menu Bar:** File, Edit, View, Favorites, Tools, Help.
- Navigation Bar:** Back, Forward, Stop, Refresh, Home, Search, Favorites, History, Mail, Print, Edit, Discuss.
- Address Bar:** Address, Go, Links.
- Left Sidebar (Blue):**
 - Contacts
 - Company Resume
 - Surface Treating
 - Induction Sealing
 - Technical Support
 - What's New!
 - Newsletters
 - Employment
 - Home
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 - Note!** The collar is on both ends, but the interlock switch is only installed on one end.
 - A. Loosen the 3 sets of screws and reposition the collar away from the bearing housing.
 - B. Ensure the interlock functions properly when repositioned.
- Status Bar:** Done, Internet.



Dirty Assembly (view 1)







Dirty Assembly (view 2)





Preventive Maintenance & Cleanliness

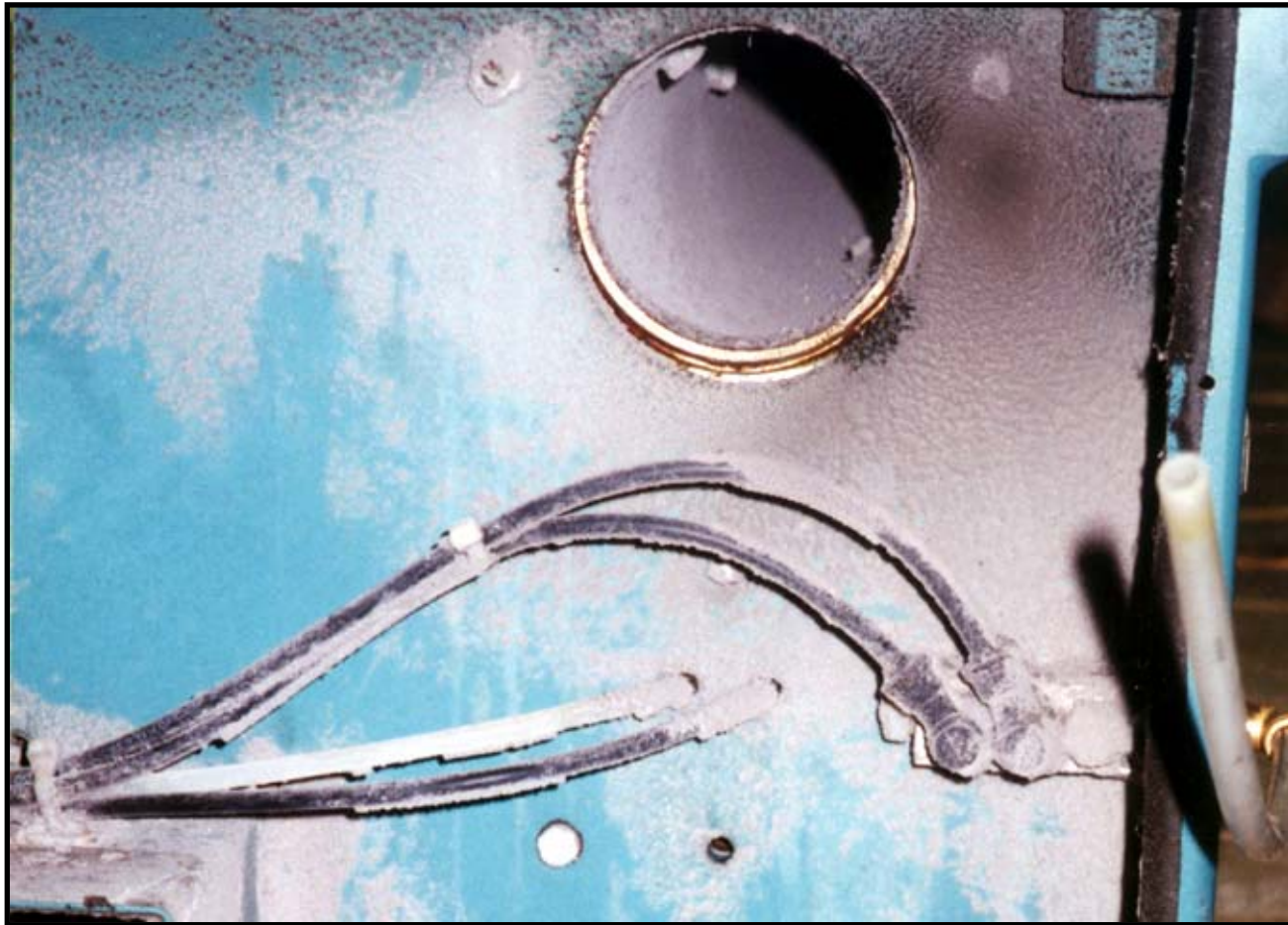
- Rolls
- Electrodes
- **Exhaust System**

Exhaust System Maintenance

- **Ozone Specifications**
- **Blower**
- **Duct Work**

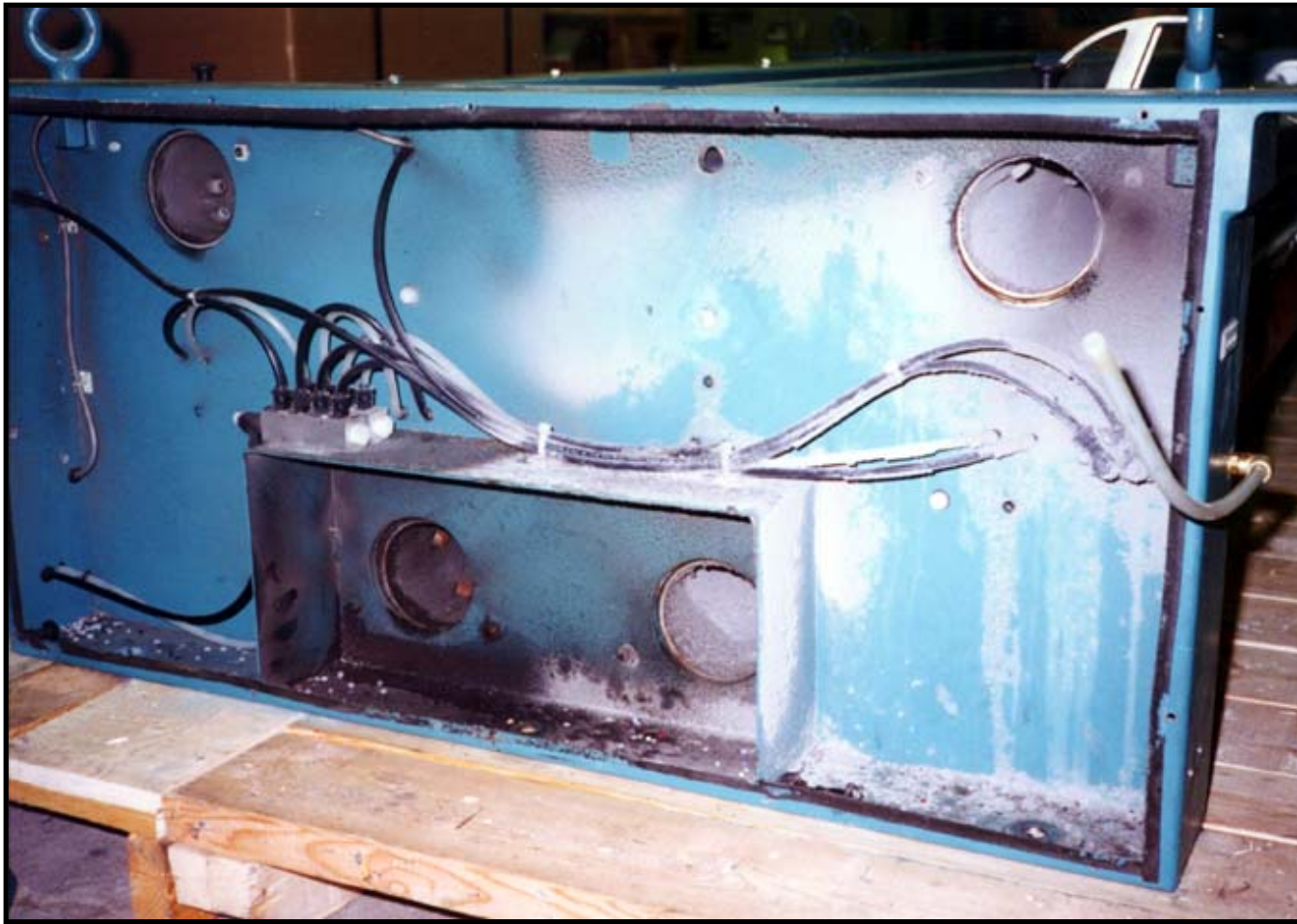


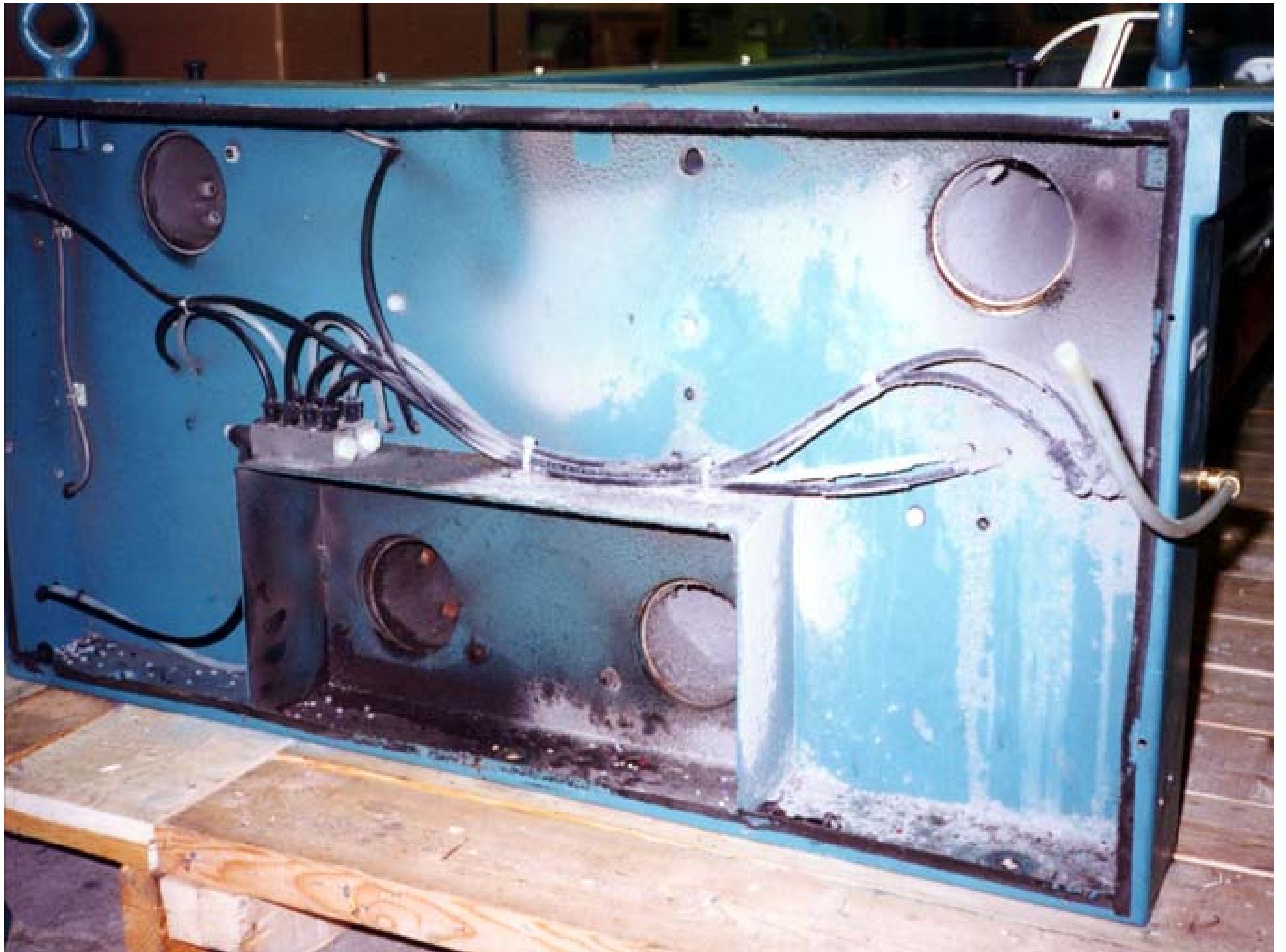
Dirty Exhaust Plenum (view 1)





Dirty Exhaust Plenum (view 2)

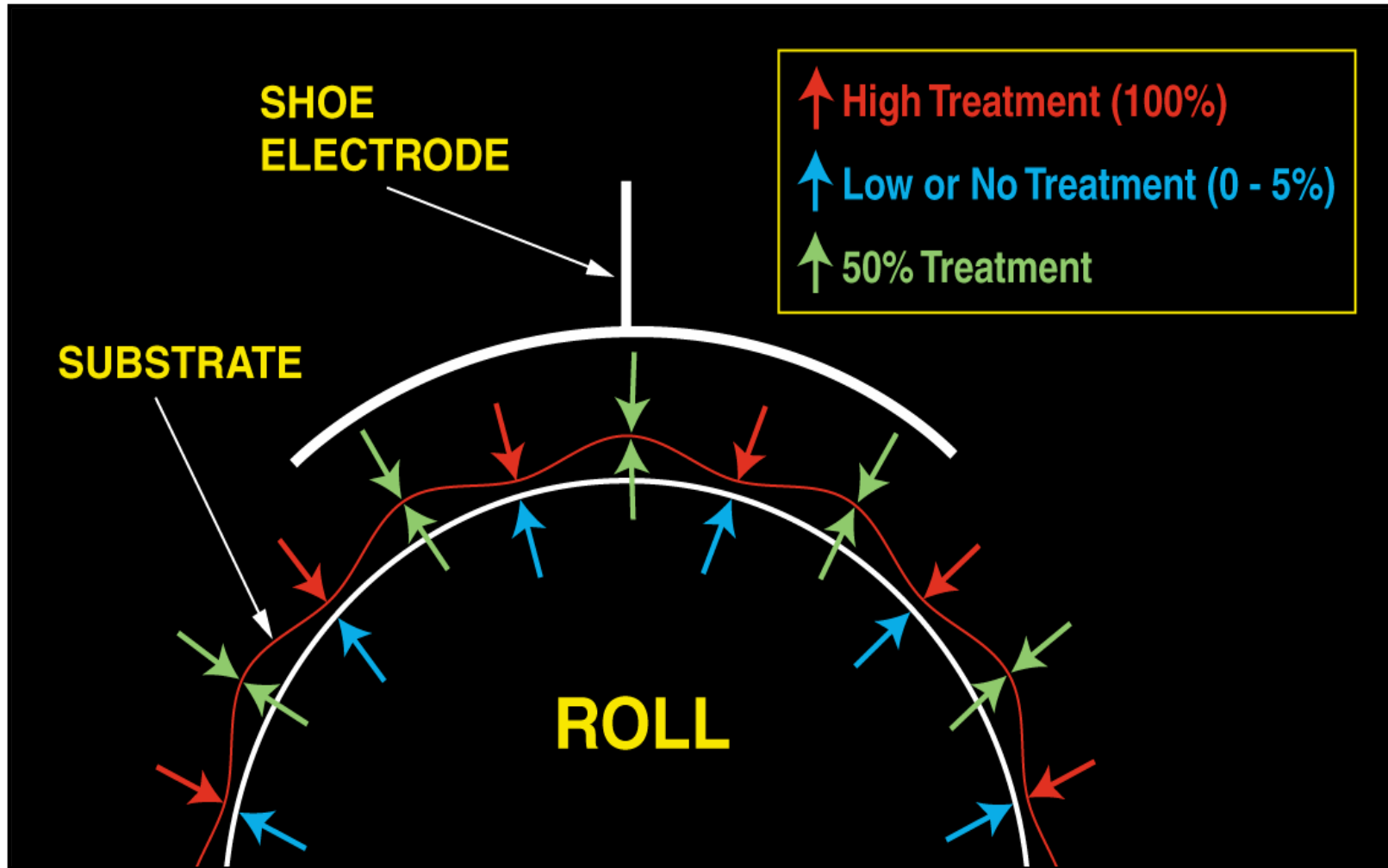




Troubleshooting/Maintenance

- Troubleshooting
- Preventive Maintenance
 - Cleanliness
- **Backside Treatment**
- Over Treatment

Wrinkling: Cause of Backside Treatment



Backside Treatment

Reduce wrinkling by:

- **Driving Roll**
- **Extend Web Wrap**
- **Increase Web Tension**
- **Add Entry Nip Roll**

Driving Roll



Roll Drive Option

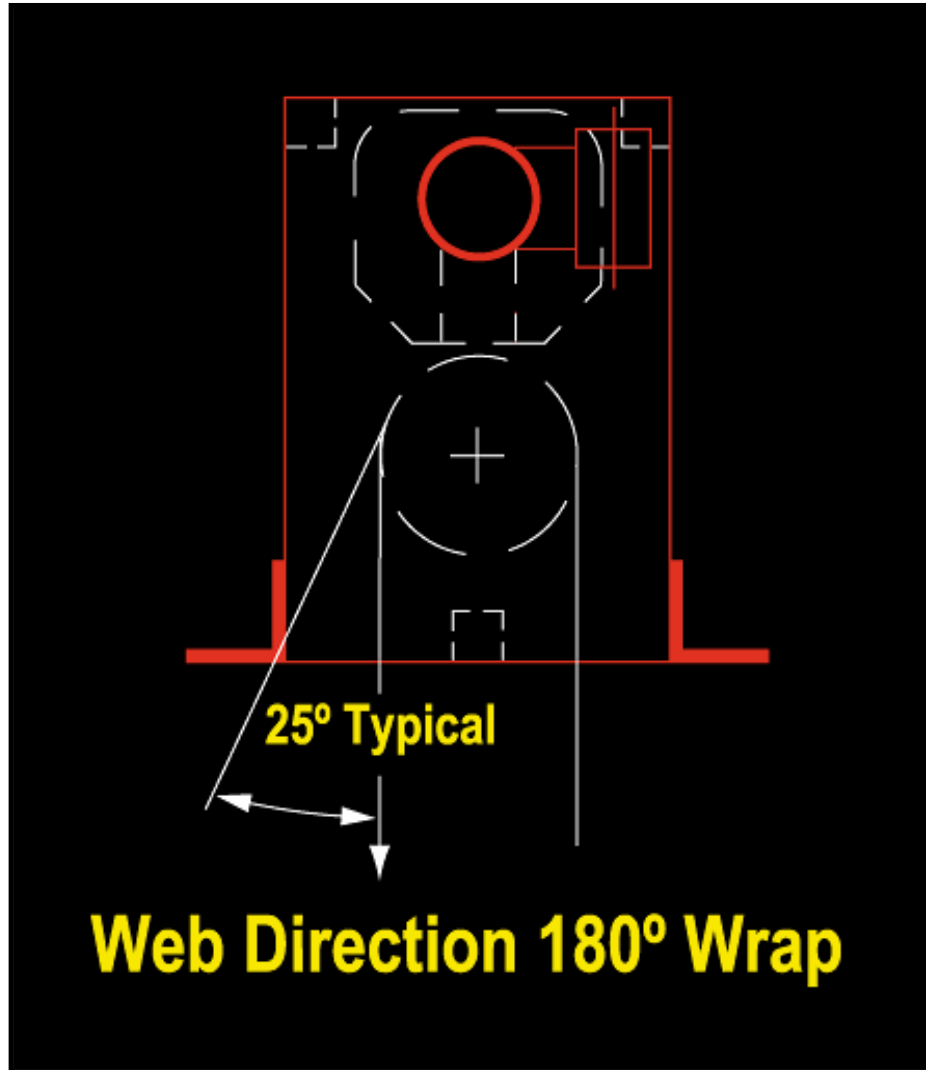
Backside Treatment

Reduce wrinkling by:

- Driving Roll
- **Extend Web Wrap**
- Increase Web Tension
- Add Entry Nip Roll



Extended Web Wrap



**Standard
Configuration**

**One Electrode
Assembly**

Backside Treatment

Reduce wrinkling by:

- Driving Roll
- Extend Web Wrap
- **Increase Web Tension**
- Add Entry Nip Roll

Backside Treatment

Reduce wrinkling by:

- Driving Roll
- Extend Web Wrap
- Increase Web Tension
- **Add Entry Nip Roll**

Early Nip Roll Option



Troubleshooting/Maintenance

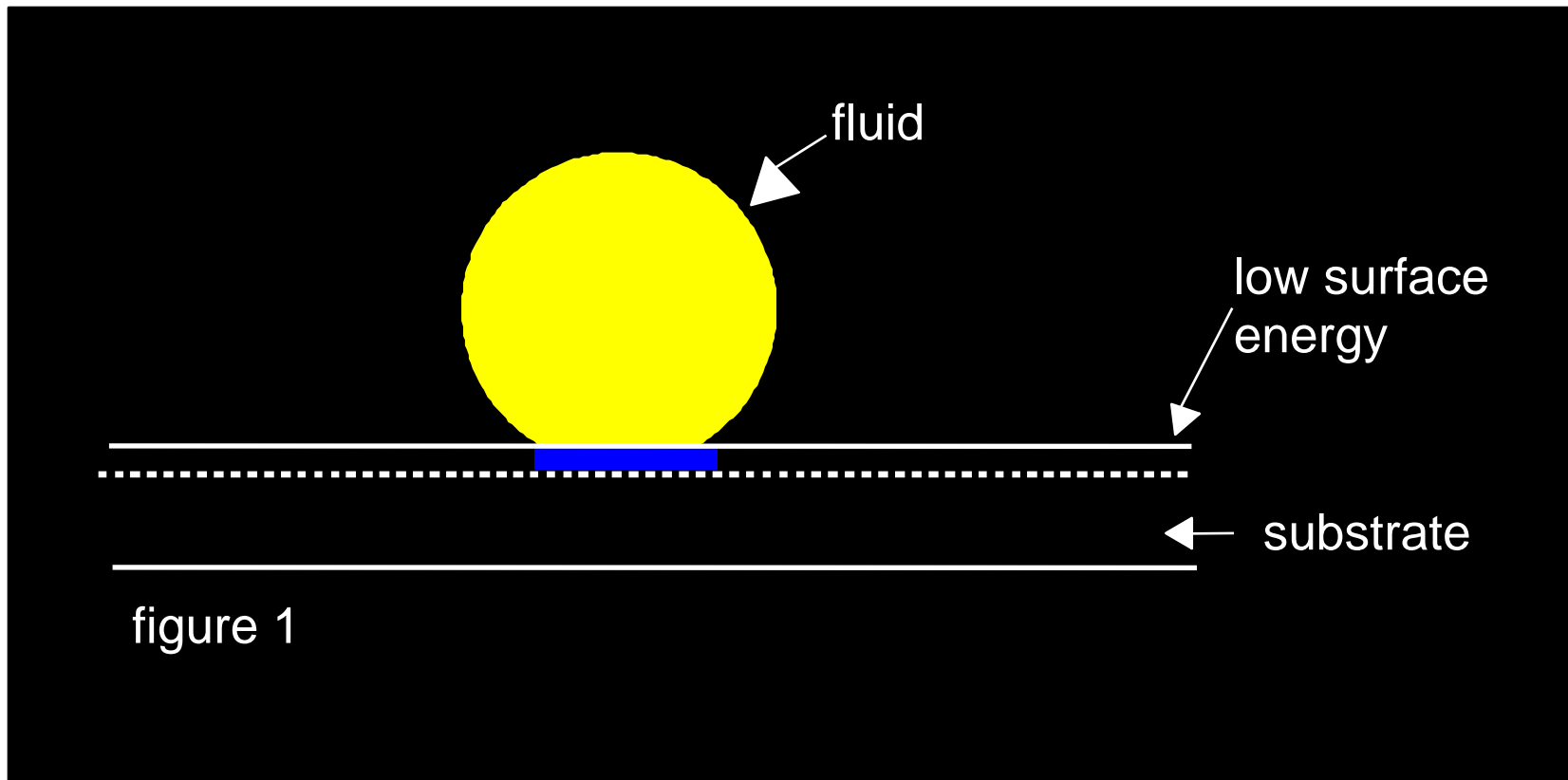
- Troubleshooting
- Preventive Maintenance
 - Cleanliness
- Backside Treatment
- **Over Treatment**

Over Treatment

- **Loss of Adhesion**
- **Heat Sealability**
- **Backside Treatment**

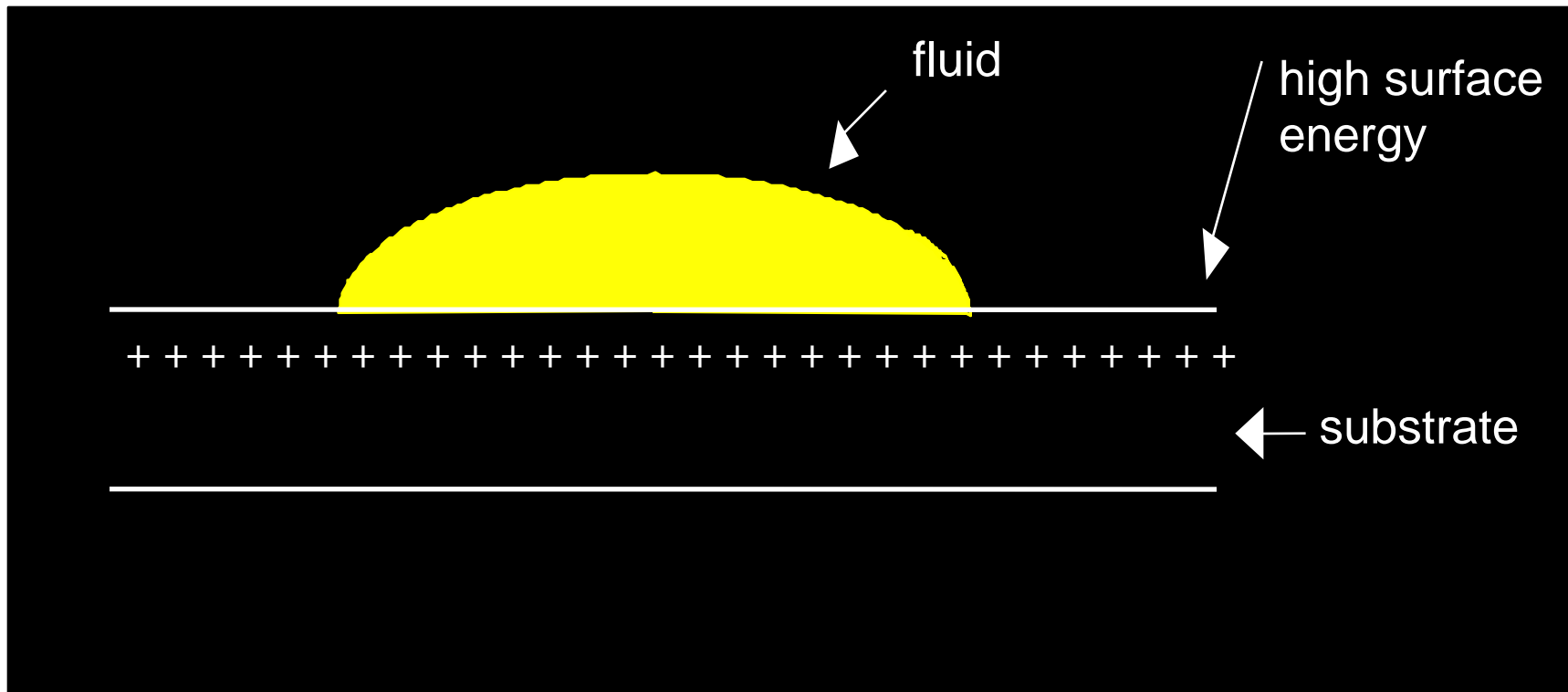


Yes, you can over treat!



Untreated Film

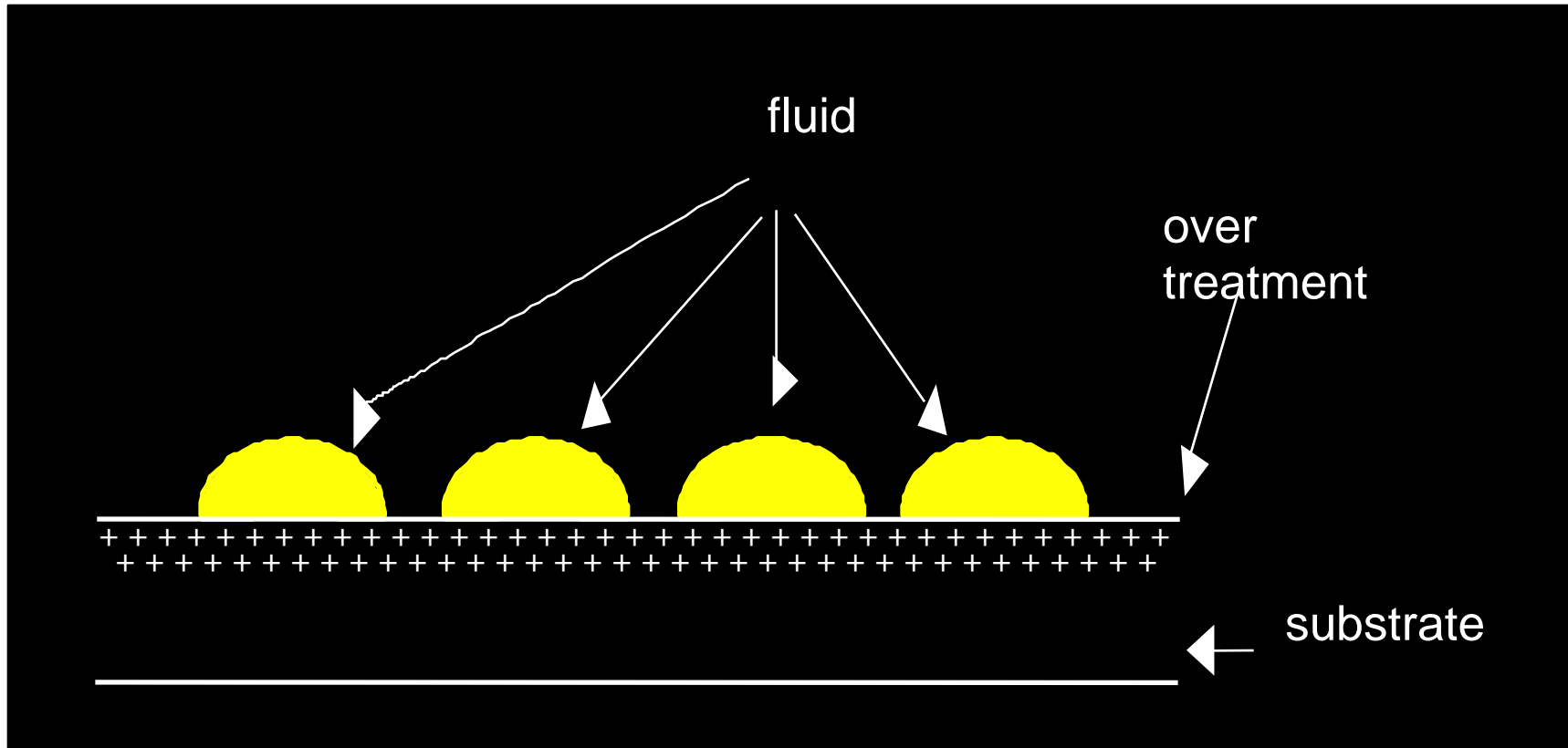
Yes, you can over treat!



Normally Treated Film



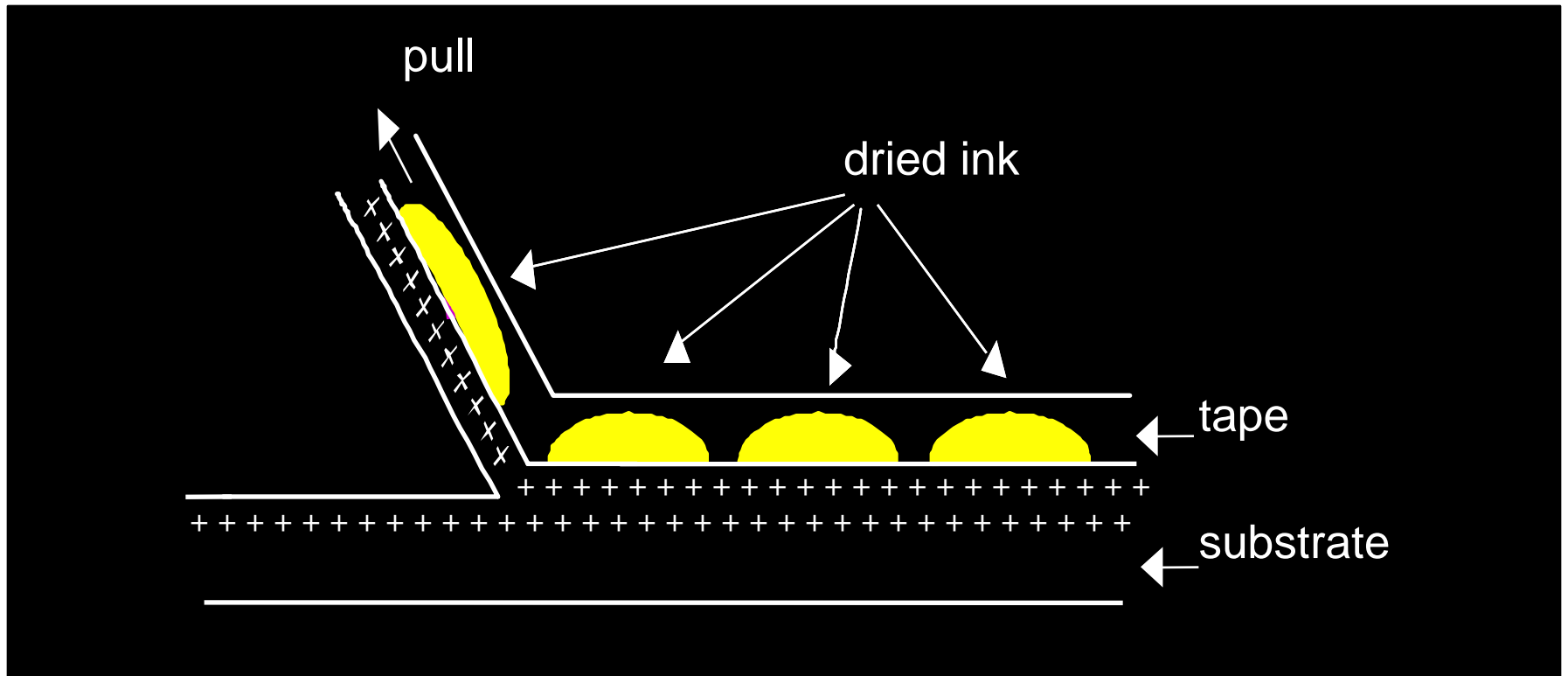
Yes, you can over treat!



Over Treated Film



Yes, you can over treat!



**Results of Over Treatment:
Surface Delamination**



Over Treatment

- Loss of Adhesion
- **Heat Sealability**
- Backside Treatment



Over Treatment

- Loss of Adhesion
- Heat Sealability
- **Backside Treatment**

System Audit

- **Outline of Activities**
- **Service Engineer**
- **Web Site Service Support**

System Audit Outline

Corona Treating System Audit

System Information:

Power Supply:

Serial Number: _____

Model Number: _____

Station:

Serial Number: _____

Model Number: _____

High Voltage Transformer(s):

Serial Number: _____

Model Number: _____

System Audit

- Outline of Activities
- **Service Engineer**
- Web Site Service Support

System Audit

- Outline of Activities
- Service Engineer
- **Web Site Service Support**

Thank You

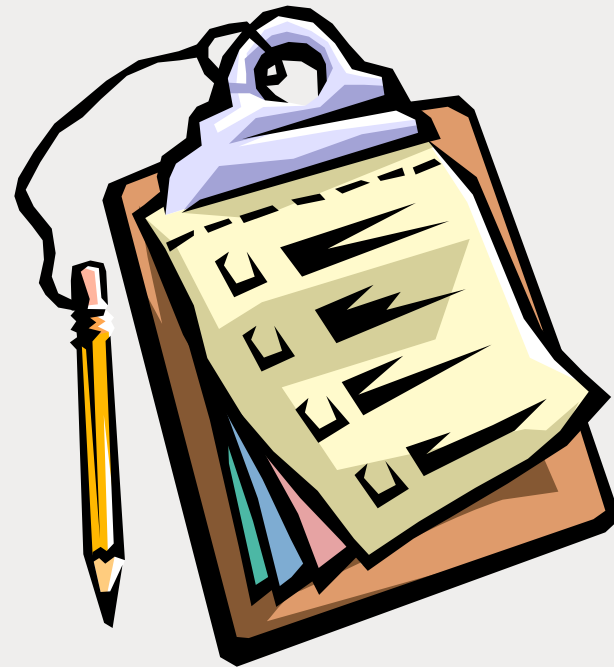
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