ATP PAINT DETACKIFIER PROGRAM

OVERVIEW
Chemical Mechanism
Application
Typical Paint/Chem Ratios

PROGRAM PRODUCTS
Detackifier
pH Adjuster
Flocculant
Biocide

FEATURE AND BENEFITS

DETACKIFICATION MECHANISM

OPERATING PARAMETERS
Degree of Paint Kill
pH
Turbidity
Suspended Solids
Chemical Feed Points

START-UP
Pre-trial Preparation
Initial Start-up

TESTING AND RECORD

TROUBLE SHOOT GUIDE
ATP DETACKIFICATION TECHNOLOGY

Today’s new paints have brought new chemistries into the spray booth with new requirements for maintenance. High-solids enamel, basecoat/clear coat, dispersion lacquer, urethane, and water-borne enamel have more complex paint solvent packages than the low solids paints of just few years ago.

The current trend seeks to reduce sludge volume while maintaining excellent detackification through innovative technology. ATP Detackification Technology is considered “state of the art” as waste regulation changes in this area. It has been developed to reduce the time and cost of spray booth maintenance and to help promote a safe healthy working environment.

What is Paint Detackification?
✓ A process by which the adhesive properties (or tackiness) of the paint overspray are minimized or eliminated.

ATP Detackifier proven technology that has capability to provide:
✓ Good detackified sludge
✓ High sludge removal efficiency
✓ Clean recirculating booth water
✓ High sludge solids and low sludge volume
✓ Low corrosion rate
✓ Better foam control (less emission)
✓ Microbial control (safety)
✓ Less bad smell

A typical paint detackification program consists of five chemical products that each serves a specific function:

• Paint Detackifier
  ✓ Reduce or eliminate paint ‘tackiness’
  ✓ Coagulation of paint solids
  ✓ Control the water cleanliness
  ✓ Dosage of detackifier is controlled by the value of turbidity

• Flocculant
  ✓ Agglomerate suspended paint solids by reducing the suspended solids in recirculating booth water
  ✓ Enhance paint sludge removal from the process
  ✓ Improve dewatering of sludge
  ✓ Dosage of flocculant is control by the value of suspended solids

• pH adjuster
Manual for Paint Detackification Program

- Ensure water is in condition to properly detackify paint solids
- Minimize corrosion rate

• Biocide
  - Control bacteria levels
  - Minimize corrosion
  - Lower the turbidity
ATP DETACKIFIER PROGRAM

ATP DETACKIFIER PROGRAM formulation effectively detackifies solvent based paints and coagulates the waterborne paints to produce paint sludge with solids content. The program has the versatility to be run as a floating, sinking or dispersing program in treating oversprayed paint, depending on system’s sludge handling requirements.

OVERVIEW

Chemical

- One component detackifier (mixture of a cationic water soluble polymer and a metal salt)

Mechanism

- Chemical Mechanism: Polymer portion
- Physical Mechanism: Metal salt portion

Application

- Excellent dispersing and/or sinking program
- Excellent floating program

Typical Paint/Chem Ratios

✓ For solvent borne paints, typical overspray paint and solvents in the booth water to SYD1501 ratio range is 8/1 to 12/1.

PROGRAM PRODUCTS

Detackifier SYD1501
Flocculant SYF1502
pH Adjuster LCD SH35

/ Optional for smell eliminate by HB GEN & PR Catalyst.

FEATURES AND BENEFITS

Single Component

- No chemical ratio balancing needed
Easier to control (either overfed or underfed)
No need for continuous monitoring
Optimize program more easily
Spend time more efficiently

Improved Performance

- Can be run as a dispersing/sinking or floating program
- Excellent program for both solvent borne and water borne paints
- Less pH sensitive
- Better foam control
- Anti-microbial characteristic chemical
- Less Total Dissolved Solids contribution due to less caustic usage
- Prolong life of booth water
- Reduce overall operating cost
- Improve system operation

Product Safety

- Safe product, non-toxic (no formaldehyde)
- Long term liabilities are reduced

Ease of Feed

- Product can be used with conventional feed equipment
- No need for extra equipment investment
- Water soluble product, quick interaction

Program Flexibility

- Contractual
- Traditional
- Dispersing/Sinking
- Floating

Excellent Detackification Results

- Killed solvent borne paints
- Demulsified water borne paints
- Provide excellent water clarity and cleanliness (low Turbidity)
- Improve sludge removal efficiency (low Suspended Solids)
- Works well with sludge removal equipment such as Palin
- Reduced overall maintenance cost
encapsulating or surrounding the neutral paint particles to produce the detackified paint sludge. At pH < 7.5 or >9 most of the amphoteric aluminum remains as a charge species such as Al$_3^+$, Al(OH)$_2^+$, Al(OH)$_3^+$ or Al(OH)$_4^-$. When the pH is too high or too low, the aluminum remains as a charge species that dissolves in the water and there is no or not adequate Al(OH)$_3$ flocs for the physical interaction. Hence, it is important to keep the operating pH ranges between 8.3 and 8.8 (preferable 8.5).

**Figure 2.** Proposed Mechanism of Detackification Program.

**OPERATING CONTROL PARAMETERS**

Typical control parameters for the recirculating booth water are pH, turbidity (T), suspended solids (SS), conductivity, total dissolved solids (TDS), degree of paint kill, foam formation, and bacteria count. Their specifications, method of measurement, and test frequency are listed in Table 1.
Table 1. Detackification Control Parameters

<table>
<thead>
<tr>
<th>Control Parameters</th>
<th>Method</th>
<th>Frequency</th>
<th>Specs</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>pH Meter, pH Paper</td>
<td>D</td>
<td>7.6 - 8.5</td>
</tr>
<tr>
<td>Suspended Solids</td>
<td>Filtration/Oven/Analytical Scale</td>
<td>D</td>
<td>&lt; 100 ppm</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Turbidimeter</td>
<td>D</td>
<td>&lt; 100 NTU</td>
</tr>
<tr>
<td>Total Dissolved Solids (*)</td>
<td>Filtration/Oven/Analytical Scale</td>
<td>W</td>
<td>&lt; 7,000 ppm</td>
</tr>
<tr>
<td>% Sludge Solids</td>
<td>Oven/Analytical Scale</td>
<td>Bag</td>
<td>35 - 55%</td>
</tr>
<tr>
<td>Conductivity (*)</td>
<td>Conductivity Meter</td>
<td>W</td>
<td>&lt; 7,000 μS</td>
</tr>
<tr>
<td>Foam Level</td>
<td>Visual/Measurement</td>
<td>D</td>
<td>2 - 3&quot; (TBD)</td>
</tr>
<tr>
<td>Water Level</td>
<td>Visual</td>
<td>D</td>
<td>Proper Level (TBD)</td>
</tr>
<tr>
<td>Degree of Paint Kill</td>
<td>Touch</td>
<td>D</td>
<td>Borderline - Good</td>
</tr>
<tr>
<td>Sludge Solids</td>
<td>Visual/Estimation</td>
<td>Per Bag</td>
<td>Record</td>
</tr>
<tr>
<td>Corrosion Rates</td>
<td>Coupons</td>
<td>Q</td>
<td>&lt; 5 mpy</td>
</tr>
<tr>
<td>Make-up Water</td>
<td>Meter</td>
<td>D</td>
<td>Record</td>
</tr>
<tr>
<td>Chemical Usages</td>
<td>Measurement</td>
<td>D</td>
<td>Record</td>
</tr>
<tr>
<td>Microbio-Activity</td>
<td>Bacteria Count Test Kit</td>
<td>W</td>
<td>&lt; 10^6</td>
</tr>
<tr>
<td>Paint Usage</td>
<td>Record</td>
<td>W</td>
<td>Record</td>
</tr>
<tr>
<td>Solvent Usage</td>
<td>Record</td>
<td>W</td>
<td>As Low As Possible</td>
</tr>
<tr>
<td># Units</td>
<td>Record</td>
<td>W</td>
<td>Record</td>
</tr>
<tr>
<td>Paint/Chem Ratios</td>
<td>Calculation</td>
<td>W</td>
<td>Record</td>
</tr>
<tr>
<td>Complete Water Analysis</td>
<td>Analytical Lab</td>
<td>Q</td>
<td>As needed</td>
</tr>
</tbody>
</table>

Degree of Paint Kill

Proper dosage of SYD1501 and pH are necessary to provide adequate paint kill. Be sure to wet the glove or fingers prior to collecting paint sludge. Slightly roll and re-roll between fingers to dewater the sludge before determining the degree of pain kill. Degree of paint kill is shown in the Table 2. Ideally is to maintain the paint kill between 8 and 9. Excessive usage of SYD1501 results in over kill paint (wet/soupy sludge) which may lead to poor sludge removal efficiency, high degree of suspended solids, high chemical cost, and excessive chemical foam in the detack process.
### Table 2. Degree of Paint Kill

<table>
<thead>
<tr>
<th>SLUDGE CHARACTERISTICS</th>
<th>DEGREE OF KILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Soupy sludge</td>
<td>Over Kill (10)</td>
</tr>
<tr>
<td>- Non-sticky when squeezing between fingers</td>
<td></td>
</tr>
<tr>
<td>- Can be rolled and rerolled between fingers</td>
<td>Good Kill (9)</td>
</tr>
<tr>
<td>- Slightly sticky when squeezing</td>
<td></td>
</tr>
<tr>
<td>- Can be washed off</td>
<td></td>
</tr>
<tr>
<td>- Can be rolled and rerolled between fingers</td>
<td>Borderline Kill (8)</td>
</tr>
<tr>
<td>- Sticky when squeezing between fingers</td>
<td></td>
</tr>
<tr>
<td>- Can be washed off from fingers</td>
<td></td>
</tr>
<tr>
<td>- Sticky and can’t be rolled &amp; rerolled</td>
<td>Poor Kill (7)</td>
</tr>
<tr>
<td>- Can’t be washed off from fingers</td>
<td></td>
</tr>
</tbody>
</table>

**pH**

pH is a measure of the acidity or alkalinity of a solution. Aqueous solutions at 25°C with a pH less than seven are considered acidic, while those with a pH greater than seven are considered basic (alkaline). In general the pH range of recirculating booth water is 8.2 to 8.8. Target pH ~ 8.5.

SYD1501 is a pH dependent detackification program. It is important to keep the pH within the target range at all time to insure that SYD1501 works at its best. LCD SH35 should used a pH adjuster that helps to raise the pH.

The recommendations of pH control are shown below:

- For only solvent borne paints, maintain pH between 8.2 and 8.8 (preferable 8.5).
• pH must be maintained within the recommended target values to maximize the chemical floc formation for the encapsulation (physical interaction) of solvent borne paint particles. pH < 7.5 or > 8.8 results in a lack of chemical flocs that leads to poor paint kill, excessive foam, lack of sludge removal efficiency, and dirty water.
• A typical usage rate of liquid caustic without blow down is usually about 7% - 10% of the SYD1501 by volume. With blow down the average LCD SH35 usage is about 22% of the SYD1501 by volume.

**Turbidity (T) < 100 NTU**

Turbidity is measured in NTU (Nephelometric Turbidity Units). The instrument used for measuring it is called nephelometer or turbidimeter, which measures the intensity of light scattered at 90 degrees as a beam of light passes through a water sample. Turbidity is caused by the presence of micro suspended particle sizes of organic/inorganic substances from paints, solvents, surfactants, chemicals, and other microscopic organisms in the booth water.

Turbidity is considered as a good measure of the degree of water cleanliness. The upper specification limit (USL) of turbidity is ≤100 NTU. However, it would be best to maintain its value as low as possible.

Underdose of SYD1501 results in high T, poor paint kill, and paint color in booth water. Overdose of BCTL2600 also results in high T and booth water has hazy milky without paint color. Turbidity and degree of paint kill can help to determine the proper dosage of a detackifier.

When bacteria count chronically > 106, high T could be caused by high concentration of bacteria. The use of detackifier alone may not be effectively to reduce the turbidity. Be sure to reduce the bug population by mean of biocide application.

**Figure 4.** Comparison between high and low T water
**Suspended Solids (SS) < 100 ppm**

Solids found in booth water are in two forms, *suspended* and *dissolved*. Suspended solids will not pass through a filter, whereas dissolved solids will. Upper Specification Limit (USL) of SS is 100 ppm. Flocculant helps to lower the SS Target SS < 40 ppm or as low as possible. Use SS values to determine the proper dosage of SYD1501.

Flocculant is used to:
- remove the suspended solids.
- enhance floating sludge.
- improve the water cleanliness.
- de-water the paint sludge.
- increase paint sludge’s solids.
- reduce and/or eliminate foam level in the pit.
- reduce or minimize foam formation

The art of using flocculant is very essential to maintain the water cleanliness. Proper usage flocculant help to control foam much better than the application of foam depressor. Cationic flocculant SYF1502 is used for the flocculation process to reduce or remove suspended solids. Flocculant must be inverted to 0.5% to 1.0% concentration before feeding to the system.

When the water looks hazy without visual paint color or visual SS, bacteria count chronically > 10\(^6\) and it’s hard to filter the booth water, it is likely that high SS is caused by high concentration of bacteria. Increasing flocculant dosage to reduce SS in this case would do more harm than good. Be sure to reduce the bug population by mean of biocide application.

**Total Dissolved Solids and Conductivity**

Dissolved solids are solids that pass through the filter paper. Dissolved solids in booth water include soluble salts that yield ions such as sodium (Na\(^+\)), calcium (Ca\(^{2+}\)), magnesium (Mg\(^{2+}\)), bicarbonate (HCO\(_3^-\)), sulfate (SO\(_4^{2-}\)), or chloride (Cl\(^-\)). Total dissolved solids, or TDS, can be measured by evaporating a pre-filtered water sample in a weighed dish, and then drying the residue in an oven at 103 to 105\(^\circ\) C. The increase in weight of the dish represents the total solids in ppm (mg/L).

Conductivity estimates the amount of total dissolved salts (TDS), or the total amount of dissolved ions in the water. Up until about the late 1970’s the units of conductivity were \(\mu\)mhos/cm after which they were changed to microSiemens/cm (1µS/cm = 1 \(\mu\)mho/cm).
High TDS and conductivity may result in higher corrosion rate, scale corrosion, and demanding more detack chemicals. Blow down booth water to waste water treatment plant or dilution of booth water with tab water is the only way to reduce the TDS and conductivity. Ideally is to keep the TDS < 6,000 ppm and conductivity < 7,000 μS/cm.

**Chemical Feed Points**

**Detackifier** – Detackifier must be fed by tapping into the header between recirculator pump and booth. The feed point should be located at the common line after the recirculator pumps. Ideally for a floating system, each booth must have its own feed point for the detackifier.

**Caustic** - Ideally, the caustic should be fed as near to the detackifier feed point as possible. However, its feed point at the pit entrance from booths to pit or at the clean well is acceptable.

**Flocculant** - For a system without sludge removal equipment, the inverted flocculant must be fed at the up stream of the sluiceway or at the pit entrance where it has the most agitation. For a system with sludge removal equipment, one feed point at the pit entrance and one feed point at the weir box are recommended.

![Figure 6. Typical flocculant day tank setup](image)
Optional for eliminate bad smell by HB GEN & PR CATALYST - A foul smell like rotten eggs is usually caused by hydrogen sulfide (H$_2$S) which is released from anaerobic bacteria. Stagnant sludge due to lack of oxygen contribution is a good source for anaerobic bacteria growth. Biocide can only be used to kill both aerobic and anaerobic bacteria in the water but not the bacteria in the stagnant sludge. Biocide is fed directly to the sludge flow into the holding tank or dewatering area. It is important to maintain the aerobic bacteria ≤10$^4$. Along with adding biocide, aeration of the sludge pit is also very important to deal with the stagnant sludge. Aeration or chlorination/or bromination is used to inject oxygen into the water. The oxygen reacts with the hydrogen sulfide to produce sulfur, which is then reduced with a side stream discharge.

START-UP/CONVERSION

Pre-trial Preparation

Spray booth application start-up can be lengthy and troublesome when inadequate preparations have been made. The following procedure is necessary to properly start-up a spray booth detackification program and keeps it performing well.

Pre-trial Meeting - All related parties.

Goals - Define your objectives, service, reporting, communication, training of plant people.

Booth Survey - Survey Form (copies to R&D and Marketing).
- Status of previous program.

Set-up Baseline - Paint samples with MSDS, Test Request Form to R&D for detackification testing (optional).
- Make-up water and booth water of the current detack program to Analytical Lab for water analysis.
- Current sludge sample to R&D Lab for sludge analysis.

Equipment - Appropriate pumps with drawn-down cylinders,
- pH meter and/or pH paper strips.
- Turbidimeter
- Explosion Proof Oven
- Suspended Solids and Total Dissolved Solids test kit
- Flocculant inversion equipment (Static Mixer or day tank with mixer...).

Chemicals - Detackifier, pH adjuster, flocculant,, biocide...
**Initial Start-up**

**Feed Points** - According to the recommendations above

**Initial Charge** - Initial charge is the minimum amount of chemicals must be present in the booth water before painting begins. Ideally, we like to start-up the ATP Detackifier program on clean fresh water. The initial charge could be varied depend on the system sizes.

<table>
<thead>
<tr>
<th>Total Booth Volume (gallons)</th>
<th>Initial Charge of SYD1501 (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5,000</td>
<td>500</td>
</tr>
<tr>
<td>5,000 - 50,000</td>
<td>350</td>
</tr>
</tbody>
</table>

**TABLE 1** Typical initial charges versus system volumes

**pH** - For only solvent based paints, maintain pH between 8.2 and 8.8 (preferably 8.5).

**Maintenance Dosage** - Use the R&D recommended Paint/Chem ratio as a starting point, then optimize the program accordingly. Refer to the Degree of Paint Kill from **TABLE 2** to determine the paint kill activity.

**TABLE 2.** The Degree of Paint Kill

<table>
<thead>
<tr>
<th>SLUDGE CHARACTERISTICS</th>
<th>DEGREE OF KILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Soupy sludge</td>
<td>Over Kill (10)</td>
</tr>
<tr>
<td>- Non-sticky when squeezing between fingers</td>
<td></td>
</tr>
<tr>
<td>- Can be rolled and rerolled between fingers</td>
<td>Good Kill (9)</td>
</tr>
<tr>
<td>- Slightly sticky when squeezing</td>
<td></td>
</tr>
<tr>
<td>- Can be washed off</td>
<td></td>
</tr>
<tr>
<td>- Can be rolled and rerolled between fingers</td>
<td>Borderline Kill (8)</td>
</tr>
<tr>
<td>- Sticky when squeezing between fingers</td>
<td></td>
</tr>
<tr>
<td>- Can be washed off from fingers</td>
<td></td>
</tr>
<tr>
<td>- Sticky and can’t be rolled &amp; rerolled</td>
<td>Poor Kill (7)</td>
</tr>
<tr>
<td>- Can’t be washed off from fingers</td>
<td></td>
</tr>
</tbody>
</table>

Depend on the degree of paint kill, we can classify the typical Paint/Chem ratios as shown in **TABLE 3**.
### Table 3. Typical Paint/Chem ratios versus degree of paint kill.

<table>
<thead>
<tr>
<th>DEGREE OF PAINT KILL</th>
<th>PAINT/ SYF1502 RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Easy</td>
<td>&gt; 20/1</td>
</tr>
<tr>
<td>Easy</td>
<td>12/1 - 20/1</td>
</tr>
<tr>
<td>Moderate</td>
<td>8/1 - 12/1</td>
</tr>
<tr>
<td>Hard</td>
<td>&lt; 8/1</td>
</tr>
</tbody>
</table>

**TESTING AND RECORD**

**Establish Baseline** - When the system is under control, send samples of the returned booth water and sludge to R&D Lab for WC test and SLU sludge analysis.

**Daily Record** - pH, turbidity, suspended solids, conductivity, degree of paint kill, sludge characteristic, water cleanliness, sludge removal, microbiological activities, and make-up water. All data must be charted, and use the Statistic Control Process (SPC) if possible.

**Weekly Record** - Total Dissolved Solids, microbiological culture, paints and solvent usage’s, number of jobs, chemical usage, Paint/ SYD1501 ratio should be collected and recorded in the SPCDATA file weekly.

**Service Report** - Upon the agreement with customers, weekly or monthly service report is highly recommended.

**TROUBLE SHOOT GUIDE**

SYD1501 is a very simple program to operate. The chemical dosage can be easily determined by observing the sludge characteristic and physical appearance of booth water’s quality. In general, the turbidity can be used to control the dosage of SYD1501. However, one who knows the symptoms of overdosage, correct dosage, and underdosage should be able to run the program smoothly. Since SYD1501 is a pH dependent detackifier, be sure to have proper pH first before taking any other corrective actions.

**Correct Dosage** - System is considered in control when paint kill is good, turbidity is less than 100 NTU, and suspended solids is less 100 ppm. In another words, the visual observation shows good paint kill, low foam in the pit, and clean water with insignificant amount of suspended solids in the recirculating water. Control SYD1501 to maintain good paint kill and turbidity less than 100 NTU (preferable < 60 NTU). Control SYF1502 to maintain the suspended solids less than 100 ppm (preferable < 60 ppm). Usually taking care of SYD1501 and SYF1502 will take of foam problem in the pit. Foam depressor can temporary kill
foam, but its residual tends to create more foam later on and create dirtier water, so foam depressor is the last resource to be used for controlling foam.

**Underdosage** - When dealing with only solvent based paints, we can classify the underdosage into two categories: **acute** and **chronic**. For the acute underdosage, the paint kill is poor and the booth water is **clean** without visual carryover (pin flocs). For the chronic underdosage, the paint kill is poor and the booth water is **dirty** without clean break (no visual carryover).

Some solvent borne paints can be considered extremely easy to detackify when the Paint/Chem is greater 20/1. In such cases if the SYD1501 is underdosed, the paint sludge may appear good kill, but most of paint them tend to dissolve in the water resulting in very dirty water (high turbidity). In such these cases, be sure to feed adequate amount of the SYD1501 to break the emulsion before adding flocculant for the sludge removal.

When dealing with the water borne paints, the paint kill is not an issue, but it is rather a waste treatment problem. Water borne paints can be totally dissolved (emulsified) in the water. When the system is underdosed, there is no water break (dirty water without visual pin flocs).

When dealing with a mixture of solvent based and water borne paints, we have to treat the solvent based paint as a detackification problem and water borne paint as a waste treatment problem.

**Overdosage** - When SYD1501 is overdosed, the solvent borne paint can be over-killed resulted in soupy sludge that disperses in the water. Also recirculating water may have a **very clean break** with significant amount of carryover (visual pin flocs). Chronic overdose of SYF1502 results in hazy milky water without paint color in the recirculating booth water. Overdose of SYD1501 cause excessive chemical foam in the booth water.

These general corrective actions

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| 1. Good Paint Kill  
2. pH in Specs  
3. T = 30 - 80 NTU  
4. SS = 30 - 80 ppm | N/A | No Action |
| Poor paint kill | 1. Improper pH  
2. Underdose detackifier  
3. Dead spot | 1. Correct pH  
2. Increase detackifier  
3. Mechanical adjustment |
| T > 100 NTU (dirty water) | 1. pH is above spec  
2. Underdose Detackifier | 1. Correct pH  
2. Increase detackifier |
<table>
<thead>
<tr>
<th>Condition</th>
<th>Cause</th>
<th>Solutions</th>
</tr>
</thead>
</table>
| T < 20 NTU (like drinking water) | 1. Overdose detackifier  
2. Overdose flocculant | 1. Reduce detackifier  
2. Reduce flocculant |
| SS > 100 ppm            | 1. Improper flocculant inversion  
2. Lack of turbulence  
3. Underdose flocculant | 1. Check flocculant inversion  
2. Move flocculant feed point to where it has the most agitation or add air lancing.  
3. Increase flocculant dosage |
| SS < 20 ppm             | 1. Overdose flocculant | 1. Reduce flocculant |
| Slimy sludge (jelly-like) | 1. Improper flocculant inversion  
2. Overdose flocculant  
3. Microbio growth | 1. Check for flocculant inversion; increase turbulence if needed  
2. Reduce flocculant  
3. Feed biocide |
| Aerobic bacteria > 10⁶  | 1. Underdose biocide | 1. Add HB GEN & PR CATALYST |
| Foamy                  | 1. Short break between productions  
2. Overdosed chemicals  
3. Excessive solvent addition  
4. Dirty water  
5. Dispersed sludge | 1. No action  
2. Adjust chemical feeds  
3. Add minimum amount of foam depressor  
4. Increase detackifier  
5. Increase flocculant |
| Foul smell (rotten egg smell) | 1. Lack of circulation  
2. Increase anaerobic bacteria | 1. Aeration of pit  
2. Add biocide |