Wet Pack Troubleshooting Workbook
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Introduction to Wet Pack Troubleshooting

Steam sterilization is widely used in healthcare facilities for terminal sterilization of packaged devices. Validated steam sterilization cycles are designed to remove air, heat the load and sterilize it, and then dry the load according to the specifications of the sterilizer manufacturer. Under normal, validated operating conditions, the devices and sets in the load will be dry following sterilization. The observation of water remaining on or in a sterilized load/pack is a concern. This is commonly referred to as a ‘wet pack’. Sterile packaging is designed to maintain a barrier between the sterilized devices and the outside world. This barrier is validated by the manufacturer to work properly as long as the wrapper or filter on a container system remains intact and dry. If left wet, there is a potential for microorganisms to penetrate into and compromise the pack. When identified, a wet pack is therefore considered non-sterile and is cause for rejection and rework. This can cause delays in sterilization services and surgical procedures. Periodic wet packs are also an indication that something (or a number of things) have changed during the preparation, sterilization or handling of devices at a facility.

Wet packs may be categorized based on where moisture is observed:

1. External moisture or water on a pack or load.
2. Internal moisture or water in a pack or load.

Wet packs in both cases can be caused by one or many issues and often require detailed investigation. It is important to note that a validated steam sterilizer that is installed and operated according to manufacturer specifications is rarely the cause of wet packs. The most common causes of wet packs are:

1. Preparation of device sets, wrapping and loading of those sets into the sterilizer. Examples can include overloading of sets in the sterilizer (in particular heavy loads) and inappropriate placement of sets/packs within loads.
2. Variations in the steam supply system. This can include inadequate installation or maintenance of steam boilers or generators, as well as the piping and traps of the steam supply to the sterilizer. As an example, centralized steam supplies can vary significantly in the quality of steam during a typical day, month or year.
3. Post sterilization handling e.g., storage of packs following sterilization. Wetness can be observed on packs due to storage conditions or inappropriate handling of packs during storage/transport.

4. Sterilizer maintenance. If the sterilizer is not correctly maintained it can also lead to wet pack concerns, such as in the case with blocked traps or drains.

It is important that the facility records and investigates the causes of wet packs to ensure a quality service. There are four essential steps to consider:

1. Initiate a Wet Pack Log to identify potential causes.
2. Conduct a review of facility practices in the packaging, loading, unloading, use, installation and maintenance of the sterilizers. Identify a cross-functional team on site to assist with the review including department and maintenance staff.
3. Remediate any problems identified to include staff training, maintenance schedules or installation corrections.

STERIS Wet Pack Resolution Escalation Process

Cross-functional team expertise is usually required at the healthcare facility to ensure successful resolution of wet pack problems. This can often include STERIS personnel. When a wet pack complaint is received the general process for resolution and the role of those involved is as follows:

1. Initial advice to the Facility by Customer Account Manager (CAM) and/or STERIS Local Service Technician
   a. Advise facility of the most common causes of wet packs (as outlined in the Introduction).
   b. Facility Sterile Processing Department (SPD) Staff/Management should complete a Wet Pack Log. A new log sheet should be used for each wet pack or load identified. This investigation should be conducted for a minimum of one week.
   c. Offer to provide a copy of the STERIS Preparation and Packaging of Instruments and STERIS Quick Response Wet Pack Troubleshooting Guides.
   d. Advise the Customer that the steam sterilizer is rarely a cause of wet packs, unless the sterilizer has not been correctly maintained. Provide the following advice.
      i. Have routine air removal tests been conducted (e.g., Bowie-Dick tests)?
      ii. Have routine maintenance tests been conducted (e.g., inspection and cleaning of drains, leak tests etc) in accordance to sterilizer manufacturer instructions?
      iii. Who is responsible for sterilizer maintenance?
      iv. Have maintenance personnel been involved to investigate the steam supply lines (including boilers)?
2. **Service Request is received at STERIS due to wet packs** – STERIS Local Service provides the facility with the advice provided above. Facility is requested to complete the Wet Pack Log and Wet Pack Checklists prior to arrival of STERIS Service technician. The Service Technician should work directly with the local Facility Engineer and/or Biomedical Engineer responsible for system checks to complete the items below before the STERIS Technician arrives at the facility. This will help to ensure timely resolution of the wet pack issue.
   a. Perform basic sterilizer checks (eg., Bowie-Dick, leak test and other items as defined on checklist).
   b. Perform central boiler steam supply checks
   c. Perform piping and trap check

3. **Local STERIS service technician** – reviews Customer investigation on arrival, performs routine sterilizer checks and corrects any issues identified to ensure the sterilizer is running to specification. This may occur concurrently with facility checklist evaluations.

4. **District Service Manager (DSM), Customer Account Manager and Mentor Technical Support** – Local technician alerts the following parties if wet pack problems persist after it has been determined that the sterilizer is functioning properly. Further investigation is at the discretion of the CAM.
   a. Review actions performed by the facility and help to establish a plan to resolve and/or escalate the issue if checks by facility personnel fail to resolve the issue. Identify appropriate resources to assist the facility if necessary.
      i. Mentor Service Engineering-sterilizer function
      ii. Clinical personnel - pack preparation and handling
      iii. Trap supplier – trap inspection, repair, maintenance
      iv. Boiler consultant - catastrophic failure, Sterile Processing Department is down
   b. Communicate with the Sterile Processing Manager, Staff and Facilities Personnel throughout the process to assist with their investigation.

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### Wet Pack Resolution Plan

The cause of wet packs is rarely attributable to a single issue and resolution of the problem can be a complex, time consuming process. This guide is intended to provide a systematic framework for the timely resolution of wet pack problems. It consists of a series of checklists designed to identify and correct various contributors to the issue. Each element of the plan is defined in the table below and checklists are provided in this guide. The wet pack resolution plan should be comprehensive and tailored according to the specific site’s needs.

<table>
<thead>
<tr>
<th>Step</th>
<th>Checklist</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correctly identify when and where wet packs occur</td>
<td>Wet Pack Log</td>
</tr>
</tbody>
</table>
| 2    | Evaluate content and preparation of packs | Load Content and Configuration Checklist | • SPD Staff/Management  
• (STERIS Clinical may assist) |
| 3    | Evaluate post-processing handling and storage | Clinical Practices Assessment Checklist | • SPD Staff/Management  
• (STERIS Clinical may assist) |
| 4    | Assess and ensure proper sterilizer performance | Steam Sterilizer Performance Checklist | • Facilities Biomed Engineering  
• Local STERIS Service Technician (if under contract) |
| 5    | Evaluate steam source | Steam Assessment Checklist | • Facilities Biomed Engineering/Boiler Technician – Central Boiler  
• Local STERIS Technician – integrated or stand-alone generator (if under contract)  
• Boiler Consultant (eg, ThermoDiagnostics) |
| 6    | Inspect piping and trap system | Steam Piping Delivery Checklist | • Facilities Biomed Engineering/Boiler Technician  
• Trap Supplier (eg., Spirax-Sarco or Armstrong)  
• Local STERIS Technician (if under contract) |
**Wet Pack Team Roster**

Team Roster information to be completed by STERIS Customer Account Manager (CAM) with Health Care Facility.

Quick, effective Wet Pack Troubleshooting requires a team effort, commitment to the plan and prompt follow-up on actions identified. After the SPD Manager and Facilities Personnel complete the checklists in this guide, the STERIS CAM and District Service Manager (DSM) will coordinate team meetings as necessary to review the checklists and decide upon next steps.

**Facility Name:** ___________________________ **Account Number:** ___________________________

<table>
<thead>
<tr>
<th>Facility Personnel</th>
<th>Name</th>
<th>Contact #</th>
<th>STERIS Personnel</th>
<th>Name</th>
<th>Contact #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sterile Processing Manager/Director</td>
<td>Sterile Processing Technician 1</td>
<td>Sterile Processing Technician 2</td>
<td>Sterile Processing Technician 3</td>
<td>Facility Biomedical Technician</td>
<td>Facility Boiler Technician</td>
</tr>
<tr>
<td>STERIS Customer Acct Mgr</td>
<td>STERIS District Service Mgr</td>
<td>STERIS Service Technician</td>
<td>STERIS Wet Pack Specialist</td>
<td>STERIS Clinical Practitioner</td>
<td>Third Party Consultant 1</td>
</tr>
</tbody>
</table>

**Wet Pack Team Facilitation Guidelines:**

1. The Health Care Facility, STERIS CAM, and STERIS DSM should coordinate activities to ensure the entire Wet Pack Team is on-site together during the process to provide a comprehensive approach and to increase effectiveness.

2. Both STERIS and Facility personnel must agree to participate in regular meetings to resolve the wet pack issue. Whenever possible, all team members should be present at each meeting to ensure information sharing for quicker resolution of the problem. STERIS CAM and DSM are responsible for generating meeting minutes, action lists and for follow-up on actions.

3. The Health Care Facility must commit resources, e.g., technicians, instrument sets, packing material, loading equipment and sterilizer(s) needed for any additional testing required in the department.

4. Issues not directly related to equipment performance may result in service charges. The Health Care Facility must commit to implementing changes as suggested by STERIS and/or Third Party Consultants. Repeat visits for the same issue where improvements have not been implemented may result in charges to the facility for STERIS time, material, travel, expenses and consulting fees.

5. Follow-up on action items is essential. The STERIS CAM and DSM are responsible for checking if all suggested improvements have been implemented.
Wet Pack Log Instructions:

Careful record keeping helps to determine the source of wet packs. Facility SPD personnel should monitor and document the occurrence of wet packs for a minimum of one week. This is to provide sufficient data for review of possible patterns.

1. Use a separate Wet Pack log sheet for each load and provide all the requested information. A sample wet pack log sheet is provided as well as a blank log sheet.
2. Complete the load diagram with set identification and weights.
3. Provide a digital photo of the processed load if possible.
4. Retain both wet load and dry load cycle tapes for review and staple to the Wet Pack Log Sheet.

Other factors to consider:

1. Frequency of wet packs.
2. Do the wet packs correlate with the load size – smaller loads OK, large loads more wet packs?
3. Has any correlation been observed with different personnel?
4. Has any correlation been observed with Shift? (Time of Day)
5. Have there been any personnel changes?
6. Are different processes followed by different personnel?
## Sample Wet Pack Log

<table>
<thead>
<tr>
<th>Facility Name:</th>
<th>General Hospital</th>
<th>Estimated Total Load Weight:</th>
<th>Approximately 216.8 lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Monday, May 23, 20xx</td>
<td>Weight of Wet Pack(s):</td>
<td>19.5, 17.7, 18.4 lbs</td>
</tr>
<tr>
<td>Time of Day (Shift):</td>
<td>1st shift</td>
<td>Loading Car Inspection:</td>
<td>Dry, drip rails installed</td>
</tr>
<tr>
<td>Sterilizer Number:</td>
<td>2</td>
<td>Exterior Pack Inspection:</td>
<td>No visible droplets</td>
</tr>
<tr>
<td>Operator:</td>
<td>B. Smith</td>
<td>Time packs Opened:</td>
<td>30 minutes after drying</td>
</tr>
<tr>
<td>Warm-up Time:</td>
<td>None</td>
<td>Interior Pack Inspection:</td>
<td>Visible droplets/dampness</td>
</tr>
<tr>
<td>Exposure Time:</td>
<td>4 minutes</td>
<td>Department Temp and Humidity:</td>
<td>70.2°F &amp; 45% Humidity</td>
</tr>
<tr>
<td>Dry Time:</td>
<td>30 minutes</td>
<td>Cycle Tape Attached:</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Load Diagram: Include Instrument set manufacturer name, description and weight of set

<table>
<thead>
<tr>
<th>Top Shelf</th>
<th>Front</th>
<th>Top Shelf</th>
<th>Front</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depuy – 17.7</td>
<td>AML</td>
<td>Core Case #2</td>
<td>Hip Instr.</td>
</tr>
<tr>
<td>Stryker – 8.4</td>
<td>Total Performance System</td>
<td>(TPS) Micro Drill</td>
<td></td>
</tr>
<tr>
<td>Depuy – 19.5</td>
<td>Pinnacle Acetabular Cup</td>
<td>(internal moisture droplets noted)</td>
<td></td>
</tr>
<tr>
<td>Depuy – 13.1</td>
<td>Quickset Acetabular Grater System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depuy – 21.2</td>
<td>Summit</td>
<td>Tapered Hip #1</td>
<td></td>
</tr>
<tr>
<td>Stealth Surgical – 13.5</td>
<td>Select-Trac</td>
<td>Master Retractor Set</td>
<td>Versa-Trac</td>
</tr>
<tr>
<td>Open</td>
<td>General Hosp. – 27.7</td>
<td>Abdominal Hysterectomy</td>
<td></td>
</tr>
<tr>
<td>General Hosp. – 9.4</td>
<td>Micro</td>
<td>Laryngoscopy</td>
<td></td>
</tr>
<tr>
<td>Depuy – 21.5</td>
<td>AML Tray #3</td>
<td>Instr &amp; Broaches (Aesculap Tray)</td>
<td></td>
</tr>
<tr>
<td>General Hosp. – 24.3</td>
<td>A.S.U.</td>
<td>Dental Set</td>
<td></td>
</tr>
<tr>
<td>General Hosp. – 15.5</td>
<td>A.S.U.</td>
<td>Minor Set</td>
<td></td>
</tr>
</tbody>
</table>

### Digital Photo: Specific Load Comments:

1. **Pinnacle Acetabular Cup**: droplets found on 2nd level in (1) cup area.
2. **AML Core Case #2**: bottom level between poly and case small droplets found.
3. **AML Tray #3 (wrapped)**: heavier moisture lower poly tray

### Wet Pack from Diagram Adjustments/Results:

- **AML Tray #3 (Aesculap)**: Place disposable liner between tiers.
- **Pinnacle Acetabular Cup**: Place disposable liner between tiers.
- **Quick Set Acetabular Grater**: Place disposable liner between tiers.
# Wet Pack Log

<table>
<thead>
<tr>
<th>Facility Name:</th>
<th>Estimated Total Load Weight:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Weight of Wet Pack(s):</td>
</tr>
<tr>
<td>Time of Day (Shift):</td>
<td>Loading Car Inspection:</td>
</tr>
<tr>
<td>Sterilizer Number:</td>
<td>Exterior Pack Inspection:</td>
</tr>
<tr>
<td>Operator:</td>
<td>Time packs Opened:</td>
</tr>
<tr>
<td>Warm-up Time:</td>
<td>Interior Pack Inspection:</td>
</tr>
<tr>
<td>Exposure Time:</td>
<td>Department Temp and Humidity:</td>
</tr>
<tr>
<td>Dry Time:</td>
<td>Cycle Tape Attached:</td>
</tr>
</tbody>
</table>

## Load Diagram:
Include instrument set manufacturer name, description, and weight of set

<table>
<thead>
<tr>
<th>Manuf:</th>
<th>Descriptions:</th>
<th>Wt:</th>
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<tbody>
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<td>Descriptions:</td>
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<tr>
<td>Manuf:</td>
<td>Descriptions:</td>
<td>Wt:</td>
</tr>
</tbody>
</table>

## Digital Photo:
(may be attached separately)

## Specific Load Comments:

## Wet Pack from Diagram

## Adjustments/Results:
## Wet Pack Log

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<th>Facility Name:</th>
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<td>Descrip:</td>
<td>Descrip:</td>
<td>Descrip:</td>
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<td>Descrip:</td>
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<tr>
<td>Wt:</td>
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<tr>
<td>Wt:</td>
<td>Wt:</td>
<td>Wt:</td>
<td>Wt:</td>
<td>Wt:</td>
</tr>
</tbody>
</table>

### Digital Photo: (may be attached separately)

### Specific Load Comments:

### Wet Pack from Diagram

### Adjustments/Results:
Load Content and Configuration Assessment Checklist

Wet Pack Resolution Checklists

In addition to completing the Wet Pack Log, the health care facility should answer the following questions and perform the recommended checks before the Local STERIS Service Technician arrives at the site.

SPD Staff/Management

*Customer Account Manager Observations (STERIS Clinical may assist)

1. * _____ Have you ever experienced moisture or water droplets on the interior or exterior of your packs? If so, when did this occur (Month, year)?

2. * _____ Do you have in place a wet pack tracking/log sheet and if so, what information do you capture?

3. * _____ Do you check product manufacturer Indications for Use (IFUs) and keep on file for reference.

4. * _____ Is staff training consistent as it relates to tray and load configuration practice?

5. * _____ Do you make use of illustrations/photos indicating best practice and how is this communicated to the staff?

6. * _____ Do you perform the recommended periodic testing of products and devices?

7. * _____ Are you lining your shelves? Shelf lining may be compensating for poor steam quality.

8. * _____ Are you draping (petticoating) your packages? Draping may be compensating for poor steam quality.

9. * _____ Do you weigh your trays? Trays exceeding sterilizer manufacturer indications for use may retain excess moisture.

10. * _____ Is the appropriate loading car being used with correct sized chamber?

11. _____ Check current packaging practice to include ALL accessories. Refer to standards such as AAMI ST79 for guidelines.

12. _____ Are rigid containers currently stacked on the loading car? Check manufacturer IFUs to verify if this is appropriate.

13. _____ How do you determine your spacing between packaging? Check that there is sufficient room for adequate steam circulation.

14. _____ Do you perform load segregation and if so, is this done manually or with an automated tracking system?

15. _____ Have you implemented quality systems to identify load weight?

16. _____ Is there a Quality Management System (QMS) program in place?
Clinical Practices Assessment Checklist

*Customer Account Manager Observations (STERIS Clinical may assist)

1. * Do you have electronic access to your device manufacturer indications for use statements (IFUs)?

2. * If so, is it a home grown filing or a third party service?

3. * What is your schedule for updating OEM IFU information?

4. * Are your trays static or do they evolve based on events at the point of use (Customer adds/deletes instruments when without performing proper testing).

5. * Are the weights of your tray contents distributed evenly or do they slide when positioned on the sterilization carrier?

6. * What type of tray accessories are in use (silicone matting, holders, roll towels, peel pouches, etc)?

7. * Do you make use of wicking material and if so, have you performed and documented your product testing?

8. * Are there other uses for wicking material other than for under dense metal items and between trays layers?

9. * Are your instruments/devices properly dried prior to assembly?

10. * Do you perform the recommended product/device periodic testing?

11. What is the percentage of inventory on hand of the following devices
   a. Simple instrument trays (minor, major, ab hyst, etc)
   b. Complex instrument trays (stereotactic, total joint trays, robotic)
   c. Single tray configuration
   d. Multi-tier tray configuration
   e. Single packed instruments
   f. Textile
   g. Other (investigational devices IRB, pharmaceuticals, lab media/liquids)

12. When was the last assessment performed on your washing/cleaning process? (automation vs. manual, automation in single chamber washer (example) vs. cart washer?)

13. When changes are made in the washing/cleaning process is another assessment performed on your sterilization practice or is it assumed the change does not affect the current process?

14. What is the training schedule of staff as it relates to clinical practices?
Steam Sterilizer Performance Checklist

Facility and/or Biomedical Engineer (STERIS Service Technician may assist)

1. Check chamber strainers (steam inlet, water inlet, jacket and drain). These must be clean.

2. Check incoming steam pressure – This must be between 50-80 psig dynamic.

3. Check if water pressure is within specification 20-50 psig dynamic – this affects performance of the vacuum system.

4. Run a vacuum leak test – A passing rate is less than 1.0 mmHg/min (Vac units only) – verifies that the piping is intact and there is no significant leakage.

5. Run a DART/Bowie-Dick Test - must pass.

6. Check the steam to chamber valve – a leaky valve will flow steam into the chamber during the dry phase and create wet loads, yet a DART or Bowie-Dick test will pass. A leak test should indicate a failure.

7. What date was the last PM performed?

8. Who performed the last PM?

9. When was the sterilizer last calibrated?

10. Who last calibrated the sterilizer?

11. Has the calibration been verified since the wet packs first started appearing?

12. Does the transfer carriage have drip rails installed?

13. Are the drip rails functioning properly?

14. Collect several good (dry load) and bad (wet load) cycle tapes for review by STERIS service.

15. Are the instruments coming out of the washer wet?

16. Are the instruments being packed wet?
Steam Sterilizer Performance Checklist (cont’d)

Facility Engineer or Biomedical Engineer (STERIS Service Technician may assist)

1. _____ Has the sterilizer been properly leveled to ensure proper drainage? Even if the sterilizer has been installed for awhile it should be verified.

2. _____ Does the sterilizer show a wide water stain inside the chamber indicating excessive water pooling?

3. _____ Are chamber and jacket traps properly functioning? It is possible that function is fine with smaller loads, but not all loads.

4. _____ Check the sterilizer Pressure Regulating Valve (PRV) for excessive pressure fluctuations at the sterilizer.

5. _____ Is the PRV gap properly adjusted? Too small and superheat can occur; too large and the large amount of steam heats the load too fast and creates too much condensate.

6. _____ Check PRV function and Rebuild/Replace/Adjust PRV if needed.

7. _____ Check boiler capacity and steam line size. Use of a PRV can dampen fluctuations; adjust as necessary.
Steam Supply Checklist

The Facility’s engineering personnel should perform the following checks prior to the arrival of a STERIS service technician.

Facility Engineer/Boiler Technician

HOUSE STEAM SUPPLY

1. ______ Check the boiler water level control. High water level can cause carryover of liquid into the steam system. Check and correct for:
   a. Faulty floats and dirty rods - clean or replace floats and control rods.
   b. Boiler feed water valve malfunction – rebuild or replace boiler feed water supply valve if necessary.

2. ______ Inspect the sight glass. If the level is too high or too low there may be a malfunctioning control system or excessive demand. If the level fluctuates excessively or shows evidence of sediment/debris check and correct for:
   a. Improper treatment of feed water
   b. Insufficient blow down
   c. Feed water supply valve defective– rebuild or replace boiler feed water supply valve if necessary.
   d. Faulty floats and dirty rods - clean or replace floats and control rods.

3. ______ Test and monitor the boiler feed water and adjust the feed water treatment if necessary. Too little or excessive treatment may cause rust or foam in the distribution system resulting in trap failure or stained loads.

4. ______ Check internal/external boiler baffling. Inadequate baffling allows liquid to escape the boiler and enter the steam supply system. Install baffling properly.

5. ______ Check boiler pressure for insufficient or fluctuating steam pressure which will affect sterilizer operation and may cause carryover of boiler water into the steam system. Clean or replace faulty floats and dirty rods.

6. ______ Check boiler capacity. If there is inadequate boiler capacity the boiler size may need to be increased or sterilizer operation may need to be staggered.

7. ______ Check the boiler rotation schedule. Improper boiler shut down/start up sequence can introduce liquid into the steam delivery system because traps may lose prime. Follow the correct sequence of shut down/start up by bringing up the secondary boiler fully before shutting down the primary boiler.

8. ______ Check for changes in boiler loading due to seasonal changes. Seasonal variability can cause liquid to enter steam lines and traps exposed to excess condensate will lose prime and take excess time to recover. Physically verify trap operation after seasonal changes with boiler.

9. ______ Check for recent boiler maintenance and physically verify trap operation after major maintenance. Shutting down a boiler can cause excess condensate to accumulate in systems. Traps exposed to excess condensate will lose prime and will not function properly or take excess time to recover. Manual intervention is required to get components online.
Steam Supply Checklist (cont’d)

If an integral or stand-alone steam generator has been installed, the following checks should be performed by the STERIS Service Technician:

**STERIS Service Technician**

**INTEGRAL OR STAND-ALONE GENERATOR**

1. Verify appropriate generator pressure set points.
2. Verify that the blow down system is operating consistently. Insufficient blow down can cause debris or foam to be carried over into the steam system resulting in clogged traps or staining of sterilizer loads. Ensure that generator is blown down on a regular interval either automatically or manually.
3. When was the last time a generator PM was done?
4. When was the generator last descaled?
5. Is the generator turning on/off about mid-level in the site glass?
6. Check for correct pressure on generator gauges.
7. Have the probes and their associated wiring been checked to make sure they are controlling the water correctly?
8. Intermittent check for high water level which could cause water carryover into steam supply.

**FULTON GENERATOR**

1. Is the generator turning on/off about mid-level in the site glass?
2. Ensure ALL the water level and alarm probes are in the proper physical locations.
3. Check the wiring against the schematic to ensure that it is routed properly. Do not assume connections are correct, as the schematic may have different wire numbers and colors, it is necessary to physically verify they are wired properly. An incorrectly wired ALWCO probe and PUMP ON probe can make water level control appear to be working, but the water levels may be too high and cause carryover.
Steam Piping Delivery System Checklist

The Facility’s engineering personnel should perform the following checks prior to the arrival of a STERIS service technician.

Facility Engineer

1. ______ Inspect the steam supply back as far as allowable. Check trap location and size, and verify that traps are working. Failing or faulty traps can cause intermittent wet pack issues. A temperature check is not sufficient. If the traps are operating all the time, the trap is either malfunctioning and passing steam, or it is open because there is excessive water in the line and the trap is trying to remove it. If there is no action, the trap may be bad and backed up with water.
   a. Facilities need to ensure they maintain traps and other components per manufacturers recommendations and keep a log of maintenance records
   b. Spirax-Sarco or Armstrong are trap suppliers who can assist with trap evaluation, repairs and replacement.

2. ______ Ensure that the proper sized trap is located at end of facility steam supply line to sterilizers.

3. ______ Does the supply to the unit come off the top of the main steam line?

4. ______ Check the take off. Side or bottom piping take offs do not hinder condensate flow downstream and condensate is carried into sterilizers. Reconfigure plumbing for top take off if necessary.

5. ______ Is there a dirt/drip leg located anywhere near connection to unit? It should be as long as the pipe diameter. Example - 6 inch supply line should have a drip/dirt leg 6 inches long.

6. ______ If steam line ends at units is there a trap and a drip/dirt leg at the end of the line?

7. ______ Is there anything else connected to this system plumbing? Washers, Kitchen, or Laundry could be causing excess condensate or boiler carryover.

8. ______ What size steam header is feeding how many units?

9. ______ At what pressure is the steam in the steam header?

10. ______ Are there gauges on the incoming steam line? If not, install gauges.

11. ______ Has the accuracy of the gauges been verified by a calibrated device?

12. ______ What is the static steam pressure with no units in cycle but ready to run?

13. ______ What is the dynamic steam pressure with unit(s) in cycle? Check for reduced dynamic steam pressure during multiple unit operation.
Facility Engineer

14. Check the pipe slope. Pipes that are not sloped towards traps or dips/sags in piping between supports can cause excess condensate in steam lines that is not being removed by the traps: Re-slope and/or improve piping support if necessary.

15. Check the pipe diameter. Insufficient pipe diameter increases steam velocity which reduces effectiveness of traps to consistently and effectively remove condensate from the steam lines. Use appropriately sized pipe (increase where necessary).

16. Check the condensate return. The traps may not be able to remove condensate from steam lines because they are not designed for existing back pressure or excess back pressure on the condensate return system. Ensure proper trap design for system back pressure and ensure that back pressure does not exceed design limits.

17. Check for proper functionality of the pump on condensate return systems with a condensate pump.

18. Check filter. NOTE: A filter is designed to remove particulates in the steam but is not a remedy for bad upstream piping configuration and/or malfunctioning traps. Filters cannot completely remove large amounts of condensate.

19. Check piping insulation. Missing or damaged insulation can create additional condensate that may exceed designed trap capacity.

20. Check if HVAC vents are blowing on piping. Adjust directional vents away from steam supply piping to prevent formation of excess condensate.

21. Check environmental conditions for significant temperature differences in the work space.
   a. Ensure that there is not significant temperature difference in work space by regulating heating and cooling system properly.
   b. Ensure that there is air differential discrepancy between load/unload work spaces.
   c. Adjust heating/cooling system seasonally to maintain proper temperature and humidity levels in prep/load/unload areas.
   d. Verify proper amount of air exchanges per hour and negative air pressure between load/unload areas.
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## Wet Pack Resolution Team

### Meeting Minutes

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References and Further Reading:


