

**Trouble shouting guide**

Troubleshooting, otherwise referred to by some of us as fire fighting, hoping to lead to fire prevention in the care and handling of surgical instrumentation.

The most common problems with instruments are discoloration, pitting, staining, spotting or actual rusting. In the event of chrome instrumentation, it is literally the cracking, fissures, and popping off of segments of the chrome finish. In any of the above instances it leads to a short life of surgical instrumentation. It is necessary to endeavor to find the cause and the cure for the problem. What we at Surgimax hope to do in this chapter is to help you identify some of the problems its cause and solution for the problem.

Problems	Causes	Solutions
Corrosion	<div>1) Presence of blood or materials in the hinge section of moving instruments.</div> <div>2) Excessive moisture left in instrument hinges, foreign matter in the autoclave and stress corrosion from not keeping hinged instruments open during sterilization.</div> <div>3) Lenin wraps containing residue of caustic detergent chemicals.</div>	<div>1)Always cleans and rinse affected areas with soft bristle brush thoroughly.</div> <div>2)Make sure to preheat your autoclave and don't rush the drying process.</div> <div>3)Clean your autoclave regularly with a solution of equally parts vinegar and distilled or demineralized water. This will remove any impurities that can cause corrosion.</div> <div>4)Carefully clean and check with the laundry to make sure Linens are rinsed thoroughly.</div>
Rust Deposit on surface	<div>1) Mixing instruments made of different metals in the same cleaning or sterilizing cycle.</div> <div>2) Tap water has high mineral content.</div>	<div>1) Separate instruments by metal type for cleaning and sterilization.</div> <div>2) Use distilled water and thoroughly dry instruments after rinsing.</div>
Rust colored film	<div>1) Chemicals in the detergent or excessive amounts of iron or other minerals from the local water supply.</div>	<div>1) Use distilled or demineralized water.</div> <div>2) In case of surface rust you can remove it by light buffing or an application of metal polish.</div>
Brown Stain or deposit of chromium oxidation	<div>1) Contamination from un-clean (some type of copper deposits or from detergents or cleaning agents high in poly-phosphates which cause a copper solubilizing action) sterilizer or cleaning equipment.</div>	<div>1) This can be eliminated by experiment with another compound that does not contain a poly-phosphate, measure the quantities more accurately and fill with cold water if you have copper water pipes.</div> <div>2) Oxidation tints may be removed by rubbing and thoroughly cleaning or placing</div>

		<p>the instrument in an acid type cleaning agent for a short period of time and thoroughly rinsing.</p> <p>3) Use distilled or demineralized water to cycle through the autoclave.</p>
Blue / Gray Stains	<p>1) Use of cold sterilizing solutions beyond recommended time.</p>	<p>1) Changing the solution frequently so as not to have any evaporation change in concentration, making sure that it contains a rust inhibitor to minimize the discoloration of the instrument and definitely making sure the instrument is even allowed by manufacturers recommendation to be cold sterilized.</p> <p>2) Many metals are not able to withstand cold sterilizing agents. Make sure when using cold sterilizing agents, distilled water is used in the final rinse or sterile water if going straight to a patient. This should also help, if the instrument is being put into storage to eliminate discoloration as we neutralize the pH of the metal surface.</p>
Yellow-Brown Discoloration	<p>1) Protein residuals, improperly cleaned surface, proteins left on the surface for a long period of time and then not thoroughly cleaned.</p>	<p>1) Proper cleaning, using a good detergent and considerable rubbing but not done with an abrasive or anything that will scratch the surface of the instrument.</p>
Purple / Black stains	<p>1) Presence of ammonia / amine crystals in autoclave system.</p> <p>2) Instrument detergents that contain ammonia in the compound makeup can be the problem. Saline solutions, blood plasma, potassium chloride and a number of other compounds can also be a cause.</p> <p>3) Detergents with a high pH can cause discoloration.</p>	<p>1) Use distilled or demineralized water to cycle through the autoclave.</p> <p>2) Check the amine exposure in the steam coming into the sterilizer, filtration may be a solution.</p> <p>3) Changing the type of detergent from an ammonia base to one of a non-ionic detergent may be a solution depending on the manufacturer's recommendations.</p> <p>4) Maintain a detergent with a neutral pH.</p> <p>5) Separate metal in the cleaning and operation of any ultrasonic, washer-sterilizer, or washer-decontaminator so that electrolysis does not take place and avoid detergents with a chloride base.</p>
	<p>1) Instrument exposed to high saline solutions, blood, chlorides,</p>	<p>1) A pitted instrument should be replaced because once pitting has occurred the</p>

Pitting	<p>iodides, potassium chloride tincture of iodides and other compounds.</p> <ol style="list-style-type: none"> <li>2) improper or impure disinfectants in cleaning agents solution can also cause pitting, which is actually removing part of the passivation surface which eventually will lead to rust, none of which of the above instruments can be used again in a surgical procedure without refinishing and in some instances replacement.</li> <li>3) Instruments can also pit when Detergents with Low pH (acidic less than 6 pH) or High pH (alkaline more than 8 pH) is used and they are not rinsed thoroughly and properly.</li> </ol>	<p>"skin" of the instrument and its hardened outer surface has been breached and further pitting and corrosion will occur.</p> <ol style="list-style-type: none"> <li>2) Use only CE Marked detergents with neutral pH (7).</li> <li>3) Clean and rinse thoroughly.</li> <li>4) Use distilled or demineralized water.</li> </ol>
Light and dark colored spots or moisture remaining on the instruments within the sterile wrapped packs	<ol style="list-style-type: none"> <li>1) Water droplets condensing on the instruments and evaporating very slowly, usually traced to a high mineral content (sodium, calcium, magnesium) in the water supply.</li> <li>2) Excessive moisture in autoclave during sterilization and termination of cycle.</li> <li>3) Caused by opening the autoclave door before steam is completely gone and slow drying occurs.</li> <li>4) Spots can also be caused by reusable instrument wrappers.</li> </ol>	<ol style="list-style-type: none"> <li>1) Ensure instruments are fully dried.</li> <li>2) Make sure that autoclave chamber is clean and check for leak in gaskets or valves to stop condensation.</li> <li>3) At the end of the autoclave cycle before the drying cycle unlock the door and open it about 6-7mm. Then run the drying cycle for the period recommended by the autoclave manufacturer.</li> <li>4) If the autoclave door is fully opened before the drying cycle, cold room air will rush into the chamber causing condensation on the instruments that may result in water stains or cause wet packs.</li> <li>5) If it is happening after the washer sterilizer, it could be the final rinse cycle needs adjusting.</li> <li>6) If it is hand washing, one needs to look at making the final rinse in distilled water or reverse osmosis if that is not already being done.</li> </ol>

\* The most effective method of dealing with instrument problems is to prevent them from occurring, it is also important to act quickly should a problem arise. Take corrective actions to prevent further problems. Remove defective instruments from service.

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