Wet Loads presentation © Tim Galekop Abstract 2006

A couple of years ago I asked Jack van Asten to help me write a booklet concerning "Wet Loads" In February 2002 Jack suddenly passed away and our walking encyclopedia was gone. He worked for the Dutch National Institute of Public Health and Environment (RIVM) for 17 years and later he started his own company. I have known Jack Since 1980 and worked with him a lot.

Out of experience we know that these wet problems can be avoided or solved, therefore we called the booklet "Wet loads an avoidable problem"

Quite often the packaging material is blamed first as being the cause of wet packs. However we are convinced that wet packs are caused by a combination of factors. Only with this topic you could fill hours. However, in Europe we see considerable changes in the sterilization programs. Some countries have extended their sterilization times from 3 minutes at 134°C to 18 / 30 minutes and increasing at the same time their drying from an average of 10 minutes to 45 minutes. Can you imagine what this does concerning condensation and wet packs? The reason for this extensive increase in sterilisation exposure times are the Prions /protein CJD.

The booklet is dealing with:

The problem,

We are not telling you anything new, but medical packaging / devices coming out wet from the autoclave shall be considered non sterile.

The amount of times I have seen that the products were left in the autoclave with the door open or been placed on the heating system to dry not to mention the hair dryer or the tea towel.
Even water in or on top of the packaging or container, some people might say yes but the water is sterile so there is no problem.

At the end of the sterilization cycle most of the sterilizer load will be electrostatic charged and therefore will be attracting contaminated dust and dirt. Just imagine that the sterile barrier system is not dry at the moment the autoclave doors are opening, the load is rapidly taking in air at the end of the sterilization cycle. If the sterile barrier system is still

wet, it has lost its bacterial barrier properties and there is a big risk of contamination, this text should probable be on every sterilizer in the world.

The theory:

To generate steam water is heated up to the boiling point. As water reaches its boiling point at approx. 100°C the temperature will not any longer rise, any energy added to the water will lead to evaporation of water thus creating steam. If steam touches a material or gas with a lower temperature than the temperature of the steam itself, the steam will give of energy and will condense and water is formed.

In order to be able to evaporate the condense one needs energy and the only way to get this energy is from its environment.
The reason why we have wet loads is that the condense gets separated from the condensation energy and therefore cannot re-evaporate.

If you want to prevent wet loads you have to obey one rule:
Keep the condense in contact with the materials it condensed on, or make sure that all condense that gets separated from its energy finds its way to the drain.

Blame it on the Steam

The most likely place for steam to lose energy on its way from the steam generator is in the pipes.

Herewith a couple of examples:

- Steam pipes not properly insulated steam will condense in the pipe.
- Water separator should be as close to the autoclave.
- If pipes run down to your sterilizer so will condense.
- Steam generator to be as close to autoclave.
- The use of a steam generator, which does not have sufficient capacity for the autoclave. Pressure drop will occur at the peak demand of steam and a “carry over” of water will happen.
- Where there is water you will create more water.
- The steam quality generated from the general steam generator is not always constant.
- Are there any chemicals added during the steam production?

It must be the Sterilizer

The sterilizer except when the manufacturer has overlooked a problem when the sterilizer was designed hardly ever causes wet loads.

Some examples:

- If you have superheated steam than this could be created due to the fact that the reduction valve is to close to the autoclave. This should be minimal ± 10 meters. The steam pressure could be 5 bar and should be reduced to ± 3 bar. Water created during this period will remain water.
  When the distance is to short the temperature will not be reduced.
  Temperature and pressure are related to each other. The higher the pressure the higher the temperature.

What when you have rain in the Sterilizer.

- The jacket has a different temperature than the chamber. It could rain in your autoclave.
- Construction of a full jacket is of course preferable. There are rib constructions around the single wall and supply steam to these ribs, which have to heat up the entire chamber wall.
- The autoclave doors have a different temperature than the chamber or walls.
- Do products touch the wall of the autoclave?
- Has the steam pipe work the right diameter?
- Is the drain valve closed? Drain water could be returned.

In a lot of cases we have seen that to solve the wet loads, one is increasing the drying time. Normally a drying time under normal conditions is 8-10 minutes. Extending the drying time to 20 minutes or even longer does not solve the problem.

What about the load

- Preheat the load is often done. The problems range from poor steam penetration, superheat, damaged sterile barrier systems and other problems.

Another possible problem could be the double tray.

- Load the instruments in a single tray preventing condense to run away to the lowest point of the Sterile Barrier System.
- Never stack two trays within the Sterile Barrier System (Double wrapping / container). The lower tray has not enough energy to dry this condense. Stackable trays are according to us not a good idea.
- Do not use support systems, which lift the instruments above the trays.
- Use instrument trays which are flat and which are close to the Sterile Barrier System.
- Advisable is not to have studs or supports. Some studs are so sharp that they even will damage your Sterile Barrier System
- Do not use warped trays.
- Do not stack trays on top of each other use baskets.
- Use loading carts
- Do not overload your autoclave
- It is advised not to mix loads Textile and instruments. If you have mixed loads the instruments should be on the bottom shelf and textile above (leaking).
- Keep the weight of the trays within the limits of ± 8,5 kg.
- Loan instruments are probable one of the biggest nightmares which we have at this moment of time.
  Trays are much to heavy, stacked trays, there should be much more communication between SBS manufacturers and the loan companies to find the right way of packaging.
- Unloading autoclave room temperature.
- Has the autoclave and packaging been validated.
- How old is the sterilizer.

It might be caused by your washer disinfector

- Take care that after your instruments have been washed they are dry before packing. Anything going wet into your autoclave will come out wet. The sterilizer will not dry your instruments.
- Some hospitals use a rinsing liquid, which is supposed to lubricate the instruments, make them shiny, and lower the surface tension of the rinsing water.

Select the right wrapping material

Packaging materials are probably one of the most important parts of sterilization after disinfection and cleaning.

In principle every Medical device, which needs to be sterilized, has to be packed. Select the right wrapping material

The choice of packaging material depends on several criteria like for instance:

- The medical device, which has to be packed.
- After sterilization a barrier is needed to protect the packed medical devices and to maintain sterility until the point at which they will be used.
- The sterilant medium has to pass through (porosity).
- Should not release any harmful substances nor considerable change (chemically or physical) during sterilization.
- The material has to pack easily so it has to be soft and memory free.
- Strong (packaging, sterilization, transport, storage)
- It must show damages and not create false safety. (pinholes)
- The packaging material must prevent contamination.
- The guarantee of an aseptic opening.
- Be compatible with the sterilization process.
- Possibly being used as a sterile field. Meaning being repellent towards low-tension liquids. We counted in a University hospital 13 different kind of low-tension liquids used in the OR.
- Has to be virtually lint free. Lint is a potential hazard for the patient.

It was Louis Pasteur who understood and proofed that bacteria can only think straight and not go around corners and he proved this with his swan hales.

I am a great supporter to use always two layers of wrap and to wrap the medical device subsequently.

WHY ?

- To create a tortuous path to prevent migration of organisms from reaching the sterile contents. By subsequently packing you always make different folds (lock)

- Double wrap = wrap - wrap
- Two sheets used in a single action are in practice only one sheet. Even if they are stuck together. We probable all remember that when conventional textile was used to wrap our instrument trays we sew two sheets together. With other words what is new?
- To be able to use different packaging methods (Packaging, envelope, roll method).
- To use different qualities, dimensions and interleaved colors to be able to differentiate between sterile and non-sterile (holes-in the theatre).
- Using interleaved colored wrap you always know that you have subsequently wrapped. Due to the colors you do not forget a layer.
- With interleaved colors you detect faster damages like holes or tears.
- If the outside of the Sterile Barrier System is expected to be sterile, wrap - wrap.
- One can distinguish sterile and non-sterile.
- To guarantee aseptic opening.

Tray-liners are widely used to solve the wet load problem. However, the tray-liner does not solve the problem but disguises it.
The right quality **Tray-liners** have a high absorption capacity and are placed in the instrument tray under the instruments. The condense is absorbed and dispersed. The instruments, which are on top of the tray-liner, help to dry the tray-liner with their radiation/energy.

How to identify the causes:

- Evaluate your load.
- Look at your procedures. Leaving your autoclave door open too long, will make the sterilizer cool down too much.
- Check the walls of your autoclave. If you can chalk or waterlines running down, you might have “carry over”.
- Do you see little circles on the ceiling of your autoclave like raindrops? Might be a cold chamber wall.
- Regularly check you condense drains and clean them at least twice a year. If they are saturated they will not take the water out of the steam.
- Are there patterns in your wet loads? (Kitchen 11 o’clock, make a logbook).
- Do you have the Monday morning effect? Condense build up in the pipe work?

First aid:

We, Ahlstrom, can provide you with a check list which might help you to identify the cause of your wet loads.
Please contact: tim.galekop@ahlstrom.com

DO NOT PANIC

Just do all the things we have mentioned.

Humidity problems remain a complex matter and are in the majority of cases created by a combination of different factors. We do understand that wet load problems can not be solved immediately, but at the same time we are convinced that these problems can be solved. In some cases this might mean that the hospital has to spend money to solve their problem and to invest into the future.

I am a great supporter if hospital, sterilizer, instrument, tray, and packaging material would to talk to each other and solve our combined problems.

It is too easy to raise the finger.

We will try to have the booklet WET LOADS reprinted within the next couple of months

A lot of things have changed over the last years. The Sterilisation department has increasingly become much more important. The Sterilisation department is the heart of the hospital, if that does not pump e.g. the O.R. can not operate. In the past CSSD staff members have been considered the dishwashers of the operating room, or the CSSD was treated, as the “social workshop” of the hospital were employees have been parked which were not fit for anything else.
Employees working in the sterlisation department should be proud for the high responsibilities they take every day.

Do not forget that we are talking about the safety of the patient and let us be honest fairies do not exist.

Tim Galekop is employed by Ahlstrom FiberComposites as “ Director of Global Business Development Medical products, responsible for Global Technical support and Regulatory affairs and have been working in the medical field for more than 29 years.
He has been a member of the Dutch Norm group from the day of foundation in 1980 and have participated in the German DIN, and the French AFNOR,
Since 1988 he is the convenor of TC 102 WG 4 Packaging Materials and is also a participant in ISO TC 198 WG 7 Medical Packaging and CEN TC 205 WG 14 drapes and gowns.