Electronic Systems for Cancer Diagnosis
Dr. Hardik J. Pandya
Department of Electronic Systems Engineering
Indian Institute of Science, Bangalore

Lecture – 56
Demonstration of Cleanroom Equipments Autoclave

(Refer Slide Time: 00:33)

Another important module that is available in the cleanroom facility here is the Autoclave. Auto is derived from the Greek word which means self and clave when we say it is a Latin word which means key. So, it is more like a self-locking device. What is the purpose like you can see Autoclave that is mentioned here? So, what is the purpose of using autoclave in a lab like us, what; this is very much resembling the pressure cooker what is used at home.

So, what if you got a vague idea when we are talking about a pressure cooker so, this is nothing, but a highly pressurized chamber. There is an immense pressure that is created because of the superheated coils which are at the bottom. So, the heating causes say, some amount of water which is poured and that heating causes the water to evaporate and a high pressure is created inside the chamber and why is this high pressure created? And this is mostly for sterilization purpose.

So, the applications are vast. This is very much resembling the pressure cookers at home. These are tabletop like the stock type autoclave. There are other autoclaves which are

really huge, there are autoclaves which are used in aerospace industries which are as huge as 10 meters long and then 3 meters wide. So, this is a comparatively smaller one for a lab like ours. And the amount of pressure, temperature what is created inside. The temperature goes up to 121 degree Celsius and this high temperature and pressure ensures sterilization of the various equipments, the devices what we are using.

Let us say; let us consider some applications. So, when it comes to dentistry or any other medical application. So, there lot of devices surgical tools which require sterilization in case reuse has to be done. And even before you reuse you sterilize them and that is when the autoclave comes into picture. In case of industries like rubber industry they have used it for vulcanizing rubber. Autoclaves are used in veterinary, they are used in food processing industries and aerospace industries like I mentioned earlier. So, the applications are vast. And when we are talking about biomedical research laboratory here, we use this in order to sterilize the small equipments what we have here.

So, that is when in case and also ensure that the device what you use inside can resist the high temperature and pressure. This has been widely adopted for sterilization, mainly because of an advantage that is, in spite of the high temperature pressure. It does an efficient sterilization without hampering the physical properties of the equipment or the tool or it could be any other; it could be any other substance what is required, what is kept inside for sterilization.

So, there are other applications like the laboratory gowns what you use, the gloves, the gowns and these the other clothing are also used there are specially designed autoclaves for sterilizing these. These gloves, the other materials what are used in the laboratory because they are prone to contamination and how do you sterilize them even in that case autoclaves are used.

So, in our case let us see how the autoclave operates, what are the different features that are provided on an autoclave. Like I mentioned this is working at a very high pressure always safety precautions has to be taken even before you operate this because at high pressure there are chances of the high pressure to cause enormous thrust on the lid if it is not sealed and then cause blast. In order to avoid one of this, let us see how to carefully operate the autoclave. So, to begin with there is a cable which goes across and can be

connected to the power cord. So, we are using the power in order to heat the coils which are beneath.

After the power cable have been connected, the main purpose is to use the heater. And once it is heated the water is converted into steam. Always ensure the water level is much higher than the level of your heater. Once that is done, you see there are different valves that are present on the top. Here, this is a dial which indicates the pressure that is built. And once it is in operation you could see the amount of pressure yellow, green and then red indicated by different colors. And this is more like a precautionary measure which has to be taken care ensure there is not much, you do not exceed the amount of pressure that has been provided. So, always monitor the pressure gauge which is provided here just like the conventional cooker so, this is the valve here in order to release the pressure.

This vent here or the whistle releases the pressure and then the value which is provided here is more a safety valve and here is the vacuum breaker. All of this are robust and tightly fixed onto the lid. So, what happens in case there is pressure which is very high that is built in? So, what happens is, the safety valve in order to release the additional pressure, there is a destructive rubber which could be inside which gets destroyed and then safely removes the pressure.

So, these are the different screw, the different nuts and the valves which are available on the top of the lid. Now, let us see what goes inside and then there is also display unit attached to the cooker here in order like you see the degree Celsius in order to set the required temperature and the time. So, this is the controller for the entire autoclave setup what we have there. The options to start, reset and also set the temperature and the desired time.

Now that you have seen there is several parts which are there on the lid in order to ensure safety. It also see always depends on how tight or lose your screws are fixed. So, you always ensure you follow the safety precautions and ensure the screws are fit tightly. Now, that we have seen what is there on the lid, let us see what goes inside the autoclave.

Another important thing to notice here is the valve this is to remove air. So, once you start, there is a mechanism. So, when the steam gets generated you do not want the air to be filled inside the chamber. The amount of heat the steam could transfer is much higher in a less time than the air which is present. So, in order to remove the air there is a valve

which is provided here to remove the air in case it is there inside the chamber; inside the autoclave. So, make sure the air exhaust is kept open and you let out all the air and once the air is discharged the exhaust is then, this could be closed and then you could create a allow it to create pressure, fill pressure inside.

(Refer Slide Time: 09:54)

Now, if I open the lid here. So, the lid has this gasket. So, it is really heavy just to ensure it tightly seals, a proper seal is created between the lid and the chamber beneath. So, you do not want any escaping of the pressure or any leakage. Now that we have seen how the gasket serves a purpose, let us see the inside of the autoclave. Now this, there is a handle that is provided here in order to lift the entire casing here.

(Refer Slide Time: 10:53)

And if you can see inside, there is a stand like structure on which the tripod like structure, this is the tripod structure on which your on which your casing sits. And then the structure which goes inside is the heater.

So, always ensure your water level is much higher and above the heater. So, that you avoid any cause; avoid any kind of burning. Now that we have seen the water level and the tripod, the container sits it above the tripod and the heat gets transferred. That is the water gets evaporated and a pressure is built.

(Refer Slide Time: 11:44)

So, the container has to ensure safety. So, there are these tight locks which are provided and then you could see the perforations on this. So, that the steam could, and that the steam where which is at high pressure and temperature could penetrate and effectively sterilize the entire system on the toolsets which are which are placed inside.

(Refer Slide Time: 12:23)

So, here we have a few devices that are placed inside. Here we have a micro fabricated chip which is under study inside the autoclave. Now that we have seen, how different tools could be placed inside the equipment a container like this. Ensure you do the proper locking of the system. Now that this is lock, I carefully place it on the tripod and then place the lid so, this is the entire setup of the autoclave. So, this entire setup of the autoclave which has high pressures which is running at very high pressures and temperature ensures repeatability in process and most widely used in order to sterilize because like I mentioned they do not cause a physical damage onto the equipments what are placed inside.

This another important application is when a medical waste which is a biohazard has to be discarded, they are processed. The pre-processing step involves using of an autoclave where you sterilize them, you the biohazard, hazardous material is put inside the autoclave in order to remove any kind of contamination that could be hazardous.

So, in case of medical equipments, in case of aerospace, in case of biomedical research

you seen the vast applications of autoclave, the importance of it for sterilizing different chemicals and different purposes. So, this was the brief study about how an autoclave can be operated and its uses. So, this is more like a steam digester which could digest and sterilize different materials and you want a clean form of the tools what you will be reusing. So, that was all about the autoclave.

Thank you.