

By sterilising nutrient media using microwaves, the process of in vitro plant production can be made doubly efficient.

Speedy sterile media



The idea to use microwave heating to sterilise media used for in vitro plant propagation arose from the experiences of the Polish based laboratory Vitroservice, which has produced more than 100 million plants over 20 years of cooperation with Dutch and German breeders of lilies and gerberas. Marek Krajczyński says, “As a supplier we have always met the highest quality standards, ensured reliability and continuity of supplies even in the busiest periods; this required continuous work on the improvement of the production process.” Krajczyński, former Vitroservice laboratory manager and innovator, continues, “Rather than continuing to increase the number of autoclaves or media preparators, we did decide that the ability to sterilize fluids as they flow through

a device would give significant advantages in terms of processing speed and space requirements.” Vitroservice has since been involved in the development of the unique EnbioJet Compact Flow Sterilizer; the manufacturing company Enbio Technology originates from Vitroservice.

Safety in UHT

EnbioJet uses a modern technology called Direct Energy Transfer (DET), which involves an immediate transfer of microwave energy to medium flowing through a Teflon chamber. The choice for DET guarantees that all of the medium is heated to a constant high temperature within only a few seconds. The process principle is similar to the well proven Ultra High Temperature (UHT) technology that has

been used in the food industry on a huge scale for many years to extend the shelf-life of products: Products are heated for 1-2 seconds at a high temperature, thereby shortening the processing time and reducing the spoiling of nutrients. Media sterilization in seconds with Enbiojet is, simply said, a kind of UHT method, significantly reducing ingredient decomposition. Krajczyński, chief technology department Enbio Technology, adds, “Microwaves also eliminate temperature gradients within the medium being processed and hence risks of under- or over-heating. Additionally, the sterilization and dispensing of the medium is conducted in one step, with savings of up to 50% in time and 50 to 75% in energy consumption compared to using either a media preparatory system or

by Anabel Evans

Sharks and Saints

Failure of a company, leading to bankruptcy, is a part of business one can do without. It is impossible to turn this process into something positive. If one of your suppliers goes down, it's a relatively small problem, particularly if the goods are commonly available; you just change some names in your Rolodex. The situation becomes more serious if it is your builder or a manufacturer of essential machinery or transport system, who fails; you lose the money paid in advance and the job does not get done. Rather unpleasant. With my last investments I asked my supplier, "Who would pick up the bill if his bank collapsed and my payments didn't reach their destination?" A serious possibility these days.

The problem is even worse if one of your customers "just forgets" to pay for several of his last truckloads and then goes bankrupt. Besides losing money, you are stuck with your crop. This is a common experience in the past year. There is always worse though. Losing your own business, or (as happened to us several years ago) a company goes bankrupt in which you are a stakeholder and became close to the company along the way. It hurts because you know the staff, suppliers and customers.

If this happens, you are promoted to the position of front row spectator and some forces will try to get you involved. It opens up a new world, I can assure you. You are forced to become acquainted with those occupations and characters that you didn't know existed. This kind of misery also teaches you about the unknown characteristics of people who you thought you knew. Starting with the ones who are the victims of unpaid bills. They are all, very legitimately, trying to cut their losses. Some are desperate over the loss of a few hundred dollar and others, actually losing thousands, just make a sympathy phone call, asking "if there is anything they can do to help". The latter definitely brought some comfort in these cold days. I was recently told about an energy company (losing real money) that showed its sympathy to their ex-client by providing him with a holiday voucher, to take a break after the turmoil was over.

Some bankruptcy lawyers are the real sharks. They use all their legal and less legal skills to intimidate everyone concerned "for the good of the creditors", but in reality for their own compensation; making sure that there will be nothing left after they are done filling their own pockets. There is one good thing, they stop bullying at the moment the well runs dry and there is nothing left to steal. So if you ever end up in this situation, stay put, do not run or hide and withstand all intimidation. Whatever they say or write, make sure you come up with an answer for every question. And make sure that you are with the right energy company.

autoclaves. Furthermore, input efficiencies arise from the mentioned very short exposure of the media to a high temperature and much lower thermal decomposition of fragile components; our experience is that the amount of agar added to the nutrient, for example, can be up to 30% less. Medium pH also remains very stable and predictable."

Validated performance

The sterilising capacity of EnbioJet is 120 to 400 L/h. Krajczyński says, "Optimum returns are achieved when laboratories are processing over 300 L per day; at 600 L per day the return on investment can be achieved after two production seasons." The recommended temperature for sterilization has been confirmed in the Vitroservice laboratory where over 10 million plants have been produced on

media prepared in EnbioJet. The microbiological validation was organized according to a procedure recommended by Sterbios using certified solutions of bacteria spores; *Bacillus subtilis* (White Ghost) and *Geobacillus stearothermophilus*, which is a standard for validation of sterilization processes with superheated steam.

Three automatic programs (rinsing, sterilization, production) are controlled via the menu on the LCD panel, which is built into the device. Software makes it possible to record and archive all process data. Enbio Technology has also developed a manual dispenser.

Krajczyński says, "With a capacity of up to 3 L/min when filling 90 ml doses, the manual dispenser can be used to fill a wide range of cup types and is easily integrated into any sterilization process line." ■■■

Experience

Agnieszka Dopierała, laboratory manager Vitroflora, says:

"Working with Enbiojet for over a year, we have experienced significant savings in time and energy costs with <0.5% contaminated cups - mainly fungal infections, zero bacteria (we use common food industry cups which are not gamma-sterilized); even in the peak season the flowing Enbiojet process can keep pace with the double shifts of the inoculation department (production was limited by the previous autoclave batch method). We have had to adapt media compositions to the new method of sterilization. Otherwise, the device has been easy to operate, we can monitor the sterilization process continually, and service support requests have been answered immediately."



EnbioJet (1800 x 600 x 400 mm) complies with EU standards including electromagnetic compatibility (EMC) and the low voltage directive (LVD) to ensure CE mark compliance. It is also TUV certified. The device is currently used by Vitroflora Poland and Steva Germany.

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