

# Spectra Launches New COVID-19 Banknote Disinfection System

**In 2014, Spectra Systems (Spectra) launched Aeris™, a unique new banknote disinfection system which uses carbon dioxide in a supercritical phase to penetrate banknotes and remove oxidised oils and other contaminants, effectively ‘washing’ the notes with gas.**

Last year, in Part 3 of our ‘Protecting Cash Against COVID’ supplement, we announced that the company was in the process of having an independent, specialist testing laboratory carry out work to validate that Aeris is effective in killing COVID-19 in addition to viruses already tested on banknotes at the same time as cleaning them.

Whilst those tests have been taking place, Spectra has developed a new, patent-pending, machine in the fight against the coronavirus and other pathogens.

This system is now available for sale and is focused on the disinfection of banknotes, as opposed to Aeris, which was specifically developed to remove soiling and extend note life. It is suitable for central banks, commercial banks, casinos and other institutions wishing to disinfect and recycle banknotes.

The Spectra BDS-1000 system can disinfect to sterile levels around 5 million banknotes an hour. It is a self-contained system requiring no consumables and can handle banknotes in loose, strapped, bagged or shrink-wrapped form. It includes a wheeled cart and ramp to facilitate the transfer of the notes into the vault for disinfection.



The Spectra BDS-1000.

According to Spectra, the system uses old ideas with a new twist, relying on the application of heat in an oxygen-free environment to neutralise viruses and pathogens. Heat in an air atmosphere has long been known to be effective in disinfecting but has the disadvantage of causing damage at the same time – not universally, but to a wide range of materials, including banknotes.

Spectra’s approach is unique in that it carries out the heat-disinfecting process in an oxygen-free nitrogen atmosphere which prevents the banknotes from being damaged. The photographs below shows the result of two banknotes having been heat treated for the same time and at the same temperature, one in normal ambient air and the other in an oxygen-free nitrogen environment.



Extreme temperature disinfection of COVID-19 in air (top) and nitrogen atmospheres (below).

Ambient air is typically 78% nitrogen and 21% oxygen, with the extra 1% a combination of carbon, helium, methane, argon and hydrogen. The nitrogen needed for the heat treatment is obtained by extracting the oxygen from ambient air in the room and hence there are no consumables or gas cylinders required. This is achieved using a nitrogen generator, which produces the gas at a continuous rate and is capable of producing a positive pressure inside the oven.

It takes between 60 and 90 minutes for the heat to penetrate the bundles of notes to achieve disinfection. The rates of viral inactivation are strongly temperature dependent, which means that as the temperature is increased, the rate goes up exponentially. The outside of shrink-wrapped bundles disinfects faster and the inner-slower.

The shrink wrap may be waterproof but it is not much of a barrier to nitrogen diffusion and it becomes even more permeable, also exponential, with temperature. The temperature time curve required for disinfection is in the 100°-130°C range for banknotes, paper or polymer.

Thorough testing of the disinfection system on a variety of banknotes has been carried out to ensure that the process does not impair either the banknote substrate or the print and security features. Threads, holograms, fluorescent features, inks, fibres and planchettes are not affected at temperatures up to 130°C as long as oxygen is absent – they are more stable in the inert nitrogen environment and, although the adhesives may soften in the heat, they reform on cooling and their adhesive properties are not impaired.

It is expected that, in the 60-90 minute disinfection process at 100-130°C, moisture will be lost from the notes. However, paper banknotes – euros, US dollars and Indian rupees – and UK and Canadian polymer notes showed no negative effects at all and the notes were not brittle. In fact, some countries desiccate notes from or in damp climates as they result in better processing, so disinfecting notes prior to processing them would be a logical process.

There have been various studies to establish whether banknotes carry the COVID-19 viruses and, if they do, how long this survives, and can it be transferred from the banknote to humans? Also, is there a difference between paper and polymer banknotes?

It is fair to say that as yet there are no absolutely conclusive results. However, should someone, for example, cough or sneeze and in doing so deposit the virus in droplets on the notes directly or from touching them, then there is a high risk of infection, especially immediately afterwards but diminishing with time.

Given this, and the fear people have of catching COVID-19 – or for that matter any new, more virulent mutation of it, or any virus new or old – then providing clean, disinfected banknotes has to be a great benefit, especially where banknotes are recycled such as in casinos, shopping centres etc.



Nitrogen generator.