



Case Study

## Millitec Weld cleaning apparatus

**Millitec cleans up with  
the help of Microsynthesis**

**Development of electrical application removes potential hazards and significantly reduces time taken to clean stainless steel welds**

Health and hygiene are vital to the manufacturing industry, particularly so in sectors such as food production.

Millitec Food Systems is a world leader in the design and technology of the food production industry. It manufactures mixers, ultrasonic cutters, depositors, butterers, sanitisers and production conveyors that can be found all around the world.

### Removing requirement for strong chemicals

Many of the company's machines are based on a stainless steel construction and this can present a real challenge to clean. When stainless steel is welded, it leaves a black tarnish mark. The traditional method for cleaning stainless steel welds is to use 'pickling paste' which is a strong and toxic chemical. However, this presents hazards to health and to the environment, is very slow and its use is highly regulated within the food industry.

Faced with this challenge, Millitec approached Microsynthesis with the aim of developing an electronic method of restoring stainless steel welds to avoid using these chemicals. The proposed product would not only be used by Millitec but would also be manufactured to offer a successful solution to help their customers.

**Challenge:** To remove or reduce the requirement for using hazardous chemicals in the cleaning of stainless steel welds.

**Requirement:** The development of an electronic method of automating and enhancing the cleaning process.

**Solution:** A microprocessor-controlled system using controlled pulses of electricity that works with a mild chemical and a conductive carbon fibre application brush.



**Microsynthesis**  
microelectronic development engineering

Microsynthesis is an electronics design house and a developer and provider of technical engineering solutions. We offer solution specification, prototyping and product development in addition to individual professional services.



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Microsynthesis worked alongside Millitec's fabricators to understand their concerns and to assess the existing processes. Microsynthesis also worked with chemical laboratories to gain the support and knowledge needed to develop a suitable product, and with mechanical and industrial designers to put together a product that fitted the specification.

### **Delivering a robust system**

A modulated high-current delivery system was specified and developed which would produce a very specific type of electricity – controlled pulses of electricity – working alongside a mild chemical and a conductive carbon fibre application brush to clean the welds.

A number of off-the-shelf components were experimented upon for the task, some of which were suitable and were used as parts in the finished design, saving on the development time and cost for the customer.

Microsynthesis developed a microprocessor-controlled system for delivering the optimum amount and type of current to the job in order to restore the weld to a bright finish. The microprocessor-controlled circuit provided all types of cleaning for different types and thicknesses of metals, and different power levels. This board, alongside some other mechanical components and a power source was the essence of the product developed by Microsynthesis.

### **Exceeding expectations for benefits achieved**

The finished design included additional features to enable the product to be used for cleaning new welds, restoring old ones and for etching onto the customers' assemblies. It was designed to save fabricators time, to reduce pollution and the risk of toxic contamination and to carry out work in areas that would have otherwise been forbidden.

In addition to the benefits of the system for hygienically cleaning its stainless steel welds, one of the key achievements of the new system was a significant time saving. Whilst the traditional method took several hours to actually clean a weld, the new method, developed by Microsynthesis now takes just a few seconds.

## The Development Process

The Millitec weld cleaning apparatus was a complex and in-depth project which required a great deal of primary research and skilled electronic engineering. Microsynthesis used its seven-stage approach when addressing this challenge:

**Identify the problem** – The traditional method of cleaning the stainless steel welds used strong and toxic chemicals and that caused particular challenges. Millitec asked Microsynthesis to explore ways of integrating electronic methodology into the cleaning process.

**Investigate the issues** – Microsynthesis worked alongside Millitec's fabricators to understand their concerns and to assess the existing processes. This collaborative partnership approach was extended to working with chemical laboratories to gain the support and knowledge needed to develop a suitable product, and with mechanical and industrial designers to put together a product that fitted the specification.

**Specify the solution** – Very much a key stage in engineering a solution for Millitec's problems. From the previous investigative work it was clear that a solution would need to be based on electronic pulses to remove the reliance on the strong and potentially hazardous chemicals for a deep clean. Microsynthesis specified in detail weld cleaning apparatus that would produce a very specific type of electricity, working alongside a mild chemical and a conductive carbon fibre application brush to clean the welds.

**Evaluate available technologies** – We do not wish to reinvent the wheel so Microsynthesis uses its technical competencies to investigate, examine and evaluate available technologies and solutions that may be used to satisfy part or all of the requirements. For this project, various technologies for controlling electronic pulses were evaluated. Also technologies for establishing a reliable radio communications link were examined. This evaluation is another very important process in the development cycle and dictates the way the project will progress, the development and unit costs, the skills and other resources required and the timeframe for completion.

**Develop new technologies** – Microsynthesis utilised its years of engineering excellence to develop the final microprocessor-controlled circuit. Several different technological components were tested and evaluated over the course of the development project to ensure that the most effective system was built.

**Engineer the product** – The individual function components were developed and prototyped in isolation but there is a significant engineering process required to convert those units into an operational system. Microsynthesis used high-reliability design techniques suitable for safety-critical applications to ensure a high performance system.

**Help the customer** – Clearly every project should satisfy the brief and help the customer. Microsynthesis' professional approach takes care throughout a project to ensure that sight is never lost of this intention and where possible, to have measurable outcomes. The output from this project was weld cleaning apparatus that could be used by Millitec and its customer to reduce the reliance on strong chemicals and to speed the cleaning process. Our help does not stop there; we also help with product commercialisation, with manufacture and with monitoring the performance of the system in service to ensure quality and to note potential improvement.

