

ADVANCED PRODUCTION SYSTEMS: PROCESS RIG FOR PRODUCTION OF INNOVATIVE HEART TREATMENT DEVICES



MTC DESIGNS UNIQUE VACUUM AND PRESSURE PROCESSING SYSTEM

Working with the University of St Andrews and funded via an EPSRC grant, the MTC has designed a system to enable the production of ground breaking prototype medical devices.



The MTC did an excellent job in designing and building a system that could cope with our requirements for vacuum and elevated pressure environments in our gas-based technology. The final result is an excellent step forward towards scaling up manufacture.

Prof Russell Morris, University of St Andrews, School of Chemistry



THE CHALLENGE

The USTAN team has developed novel materials that allow the release of an active agent from the surface of medical devices. The agent can prevent problems such as blood clotting and spasm, which frequently occur when deploying medical devices inside blood vessels.

The preparation of the devices requires a multi-step process involving the application of vacuum, temperature and different gases at certain pressures. The pre-existing experimental rig only allows for processing of single samples of maximum length 10cm. The primary goal for this project was to design and manufacture a test rig to process longer samples – in larger batches – to enable future scale-up of production.

A unique challenge was presented in the requirement to deliver both vacuum and pressure capability within the same system, and to ensure that the system was capable of handling potentially hazardous gases.

MTC'S SOLUTION

- ▶ Requirements Capture & Concepting – the MTC captured the precise requirements for the rig [e.g. dimensions, materials] and the key process parameters [e.g. vacuum pressure, temperature] then proposed concepts to deliver the process.
- ▶ Design & Procurement – the MTC identified suppliers and worked with them to develop a bespoke process reactor system. Concurrently, the team designed and manufactured a number of additional elements such as a sample holder and control console.
- ▶ Commissioning - the MTC made necessary modifications to the supplied process reactor to integrate with all ancillary systems, then conducted trials to ensure process integrity under operating conditions.

THE OUTCOME

- ▶ The MTC harnessed its expertise in building specialised equipment to address the challenge of delivering a unique processing rig that could handle both vacuum and pressure.
- ▶ A bespoke system was designed using commercial off the shelf hardware where possible to reduce build costs and in life servicing.
- ▶ Specialist hardware was manufactured by the MTC workshop and a bespoke physics model was developed to understand sample heating.
- ▶ The MTC used its expert network of consultants for vacuum technology and gas suppliers to inform the design and operation of the process.
- ▶ The MTC used its industrial knowledge to advise on commercialisation and production scale-up for future prototype medical devices.

BENEFITS TO THE CLIENT

- ▶ A unique process rig enabling a step change in development of prototype devices.
- ▶ Scale-up capability: samples/device size increased from 10cm to 30cm in length.
- ▶ Scale-up capacity: one-off samples increased to batches of up to 12 units.
- ▶ Sample flexibility: large size of processing chamber (approx. 10-fold increase compared to previous experimental rig) allows devices of different sizes and shapes to be processed.
- ▶ Process parameter optimisation: increased flexibility in processing parameters (e.g. range of temperature/ gas pressure) to ascertain optimal processing conditions.



This is a great project that showcases the MTC's ability to design and build unique equipment with challenging requirements; delivered by a great team of people!

Shan Dulanty - Chief Engineer, Industrial Growth, MTC



10⁻⁴ mbar

Vacuum pressure

6 bar

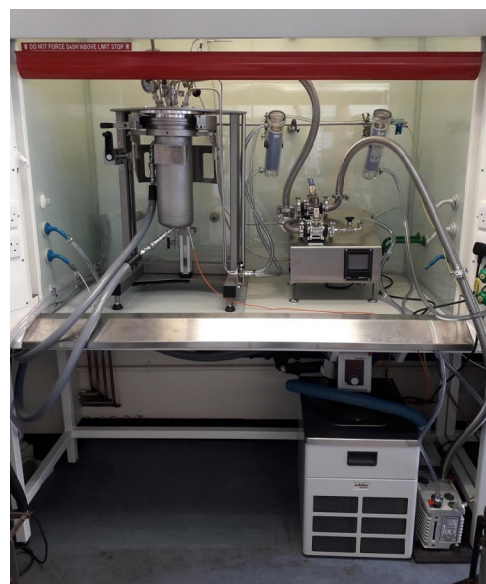
Gas 'overpressure'

12+

12 or more individual samples can be processed in a single batch



Commissioning & Testing at MTC



Setup at USTAN