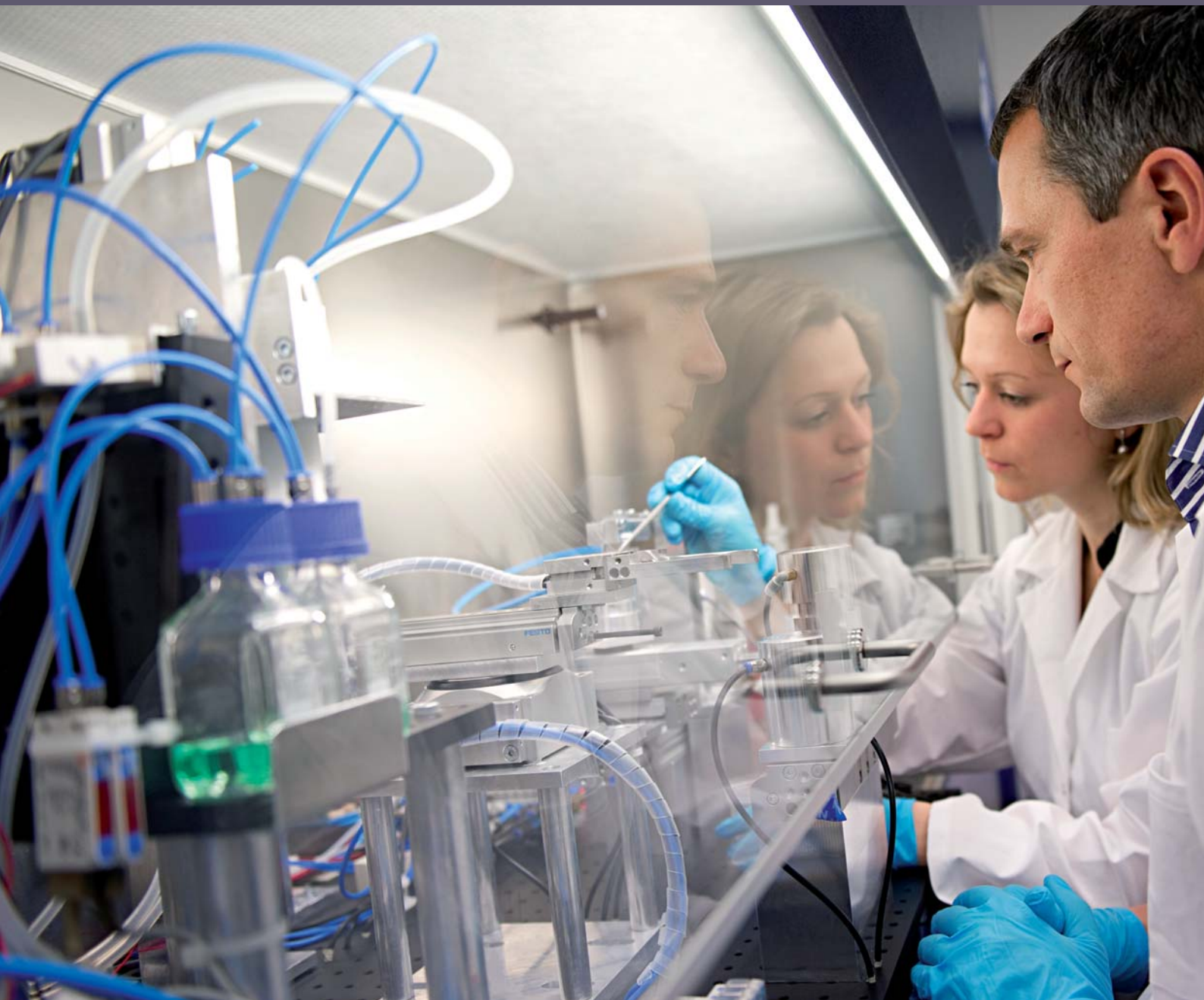




Fraunhofer

**BIOTECHNOLOGY – ENGINEERED SOLUTIONS
FOR BIOLOGICAL PROCESSES**





Automation of complex biotechnological processes

Traditional laboratory processes are often characterized by a high degree of manual handling operations and require trained laboratory personnel. Consequently, automation in biotechnology has become a significant trend – not only in the form of discrete devices of automated laboratory and analytical equipment, but increasingly by the linking of separate biotechnological processes into fully automated production systems. The automation increases throughput, reproducibility, process stability and enables continuous process monitoring. These features are essential for the successful industrial production of biotechnological products.

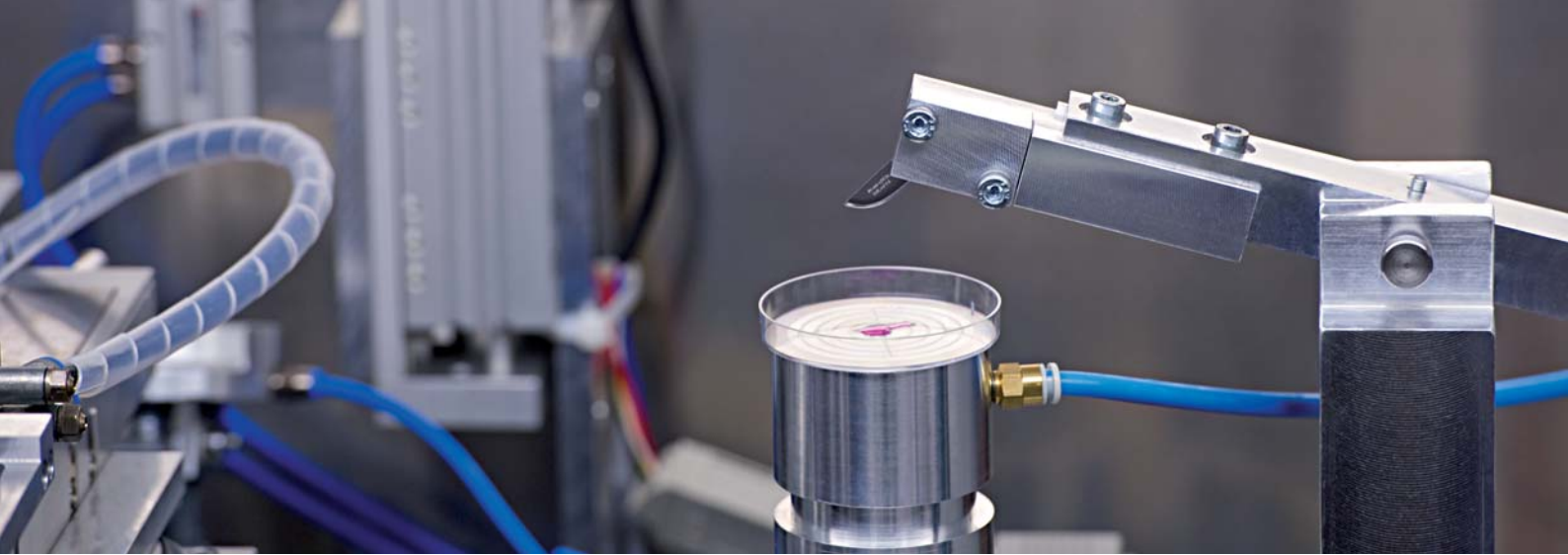
In our business area “Life Sciences Engineering” we are developing automated systems for complex biotechnological processes, currently focussing on tissue engineering, stem cell biology and plant-based biopharmaceuticals. The challenge in these three highly industry-relevant research fields lies in the modification of the established manual and laboratory procedures for the specific requirements of process automation. Within our state-of-the-art research facility, we develop adapted process concepts, implement them into custom-built prototypes and optimize the process parameters. In the subsequent development of fully automated production facilities, these individual solutions are integrated into automated systems and production environments.

Automated devices and laboratory equipment

In addition to fully automated production facilities, we offer the development of stand-alone handling solutions and highly specialized laboratory devices. Examples include custom instruments such as an automated microplate loader or a multiplexed tissue homogenizer, which help to save time and personnel while standardizing manual processes. The combination of our experience in automation and our in-house facilities for manufacturing and assembly of components and first-of-a-kind automation equipment enables us to respond to individual and highly specific customer and process requirements.

Monitoring of biotechnological processes

Our department for production metrology is specialized in developing customized sensors and devices for monitoring biotechnological processes in automated production systems. To realize high precision non-destructive measurements, our main focus lies in optical technologies and sensors. In the challenging field of cell and tissue culture, we develop automated devices to monitor the sterility and cell growth of cultures. Therefore, we use turbidity sensors, spectroscopic analysis and image processing to measure and analyze growth characteristics. For the novel field of tissue engineering, we designed an automated optical coherence tomography system, that acquires high resolution tomographic images of living tissue for the assessment of tissue quality and structure of artificial skin equivalents. With the fast growing market of life sciences, our aim is to provide smart solutions to enhance and support automatic and semiautomatic biotechnological production processes.



High volume producible nano and micro structured cell culture surfaces

Surface functionalization by means of micro and nano structuring allows selective influencing of the growth behavior of adherent cells. Utilizing mechanical processes such as diamond machining, and laser processes such as ultra-short pulse laser patterning, we can produce a wide variety of natural and artificial surface structures which can impact adhesion, growth and migration of cultivated cells as well as the differentiation behavior of stem cells. Functionalized surfaces can also be utilized in automated processes for example to control selective cell adhesion or increase cell proliferation rates. Our services include design for manufacturing of micro and nano structures, structure master and mold making, and structure replication in biocompatible polymers.

Advantages through interdisciplinarity

At Fraunhofer IPT we combine extensive experience in manufacturing technology, automation, custom machine development, metrology and strategic technology management. This interdisciplinary approach is essential to fulfill the complex requirements of automated biotechnological processes. Close interaction between our different departments is a decisive benefit for the processing of projects. The direct exchange of interdisciplinary knowledge enables our high aptitude for innovation. Our strong experience with the management of complex multilateral R&D projects and our constant focus on market developments also contribute to the success of our projects.

We offer

- Market and technology research and strategic consulting
- Process analysis, identification and definition of automation potential
- Concepts for process automation and implementation.
- Development of customer-specific equipment prototypes and handling solutions
- Testing and evaluation of automation equipment in our internal biotechnology laboratories
- Development of complete systems for the automation of biological and laboratory processes
- Development of sensors and test systems for online process control of tissue, cells and media
- Manufacturing of micro and nano structured cell cultivation surfaces

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