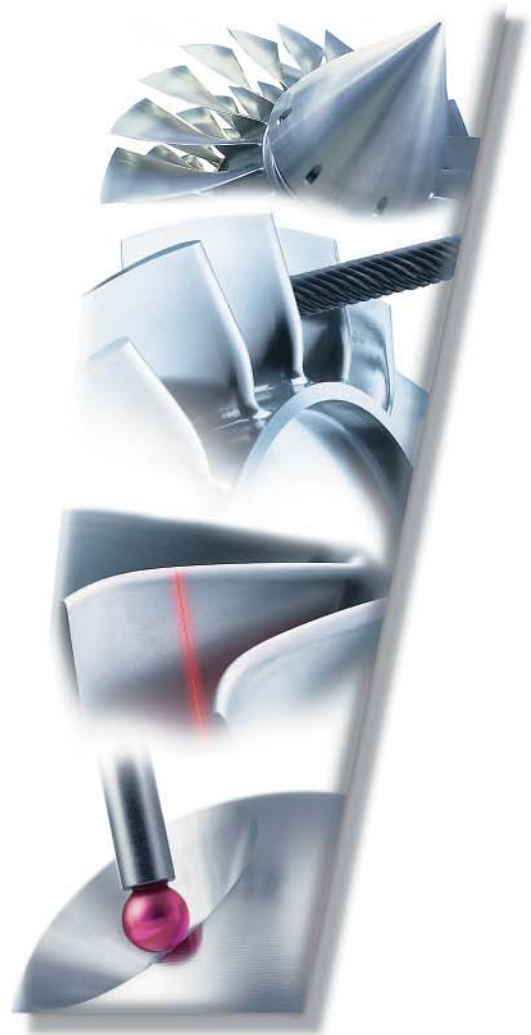# Automatic Machining of Individually Shaped Workpieces

In-Process Scanning

Adaptive Machining

System Integration

BCT.

BCT – Automated Machining of Individually Shaped Workpieces

BCT GmbH, a system supplier founded in 1986, specializes in solutions for in-process scanning and adaptive machining. The engineers, computer scientists, mathematicians and applications specialists at BCT carry out all phases of your projects from consulting over development to after-sales service.

Our focus…

…is on software solutions for the automated machining of individually shaped workpieces. Our main activities are:
– measuring and scanning technologies
– adaptive machining
– system integration
Our goal is to create automated complete solutions by linking single systems. This approach results in improved accuracy and increased throughput while lowering costs and maintaining a high flexibility.

Our know-how…

…is the foundation of our success. As a pioneer in technology for reverse engineering applications, BCT has many years of experience in the use of CAD/CAM/NC together with measuring and manufacturing methods. BCT works together with both users and manufacturers of machines, controls and sensors. This kind of collaboration results in cutting-edge technology systems.

In-Process Scanning:
Capturing Shape & Securing Quality
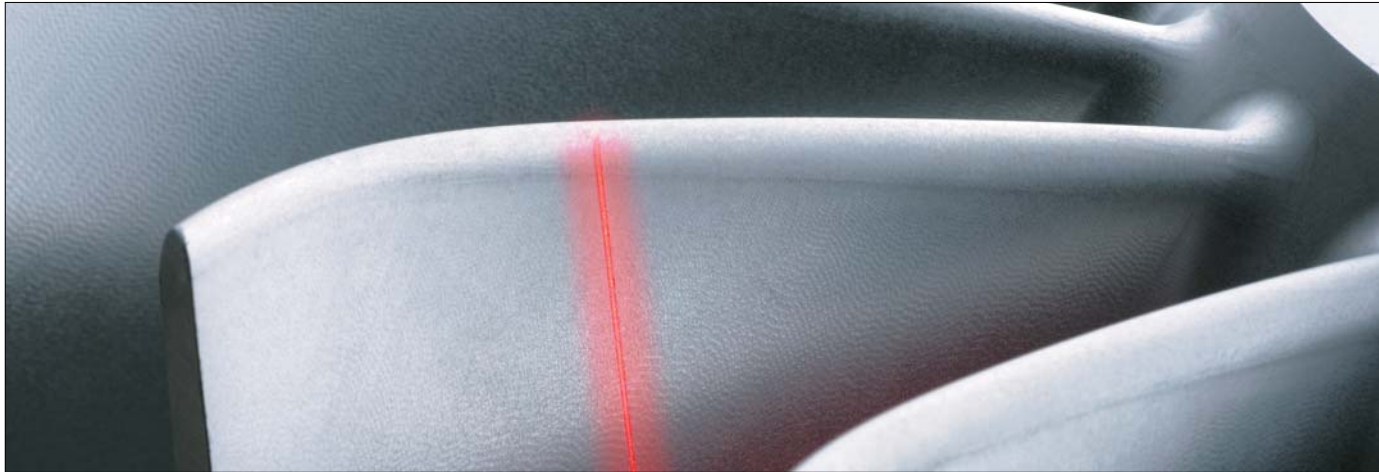
Tactile measuring and optical scanning

Our systems for process-integrated measuring and scanning optimize accuracy and quality. We offer solutions making use of:
– touch trigger probes for pointwise measuring
– optical laser line sensors for area scanning

Integration into the NC environment

We attach special importance to the perfect integration of measuring technology into the machine and control environment. BCT solutions run on PCs and can be connected to common NC controls.

Measuring before/during/after NC machining
– Measuring performed before NC machining detects inaccurate clamping positions and deviations in the shape of individual workpieces; for example, for workpiece alignment or the subsequent adaptive machining.
– Measuring performed during NC machining prevents manufacturing errors. Deviations can be identified early on and corrective action taken to prevent the production of scrap.
– Measuring performed after NC machining makes it possible to quickly inspect the workpieces on the NC machine. A convenient software package compares nominal and current values and performs extensive analyses.

Applications development

In addition to our standard solutions, we can develop software solutions custom-tailored to your special requirements.
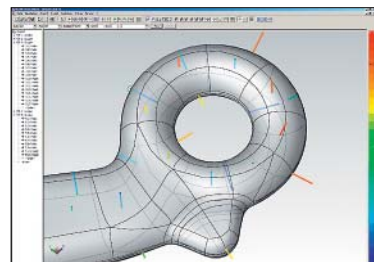
Adaptive Machining with OpenARMS
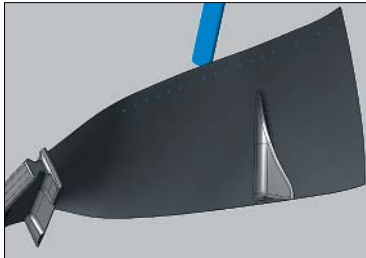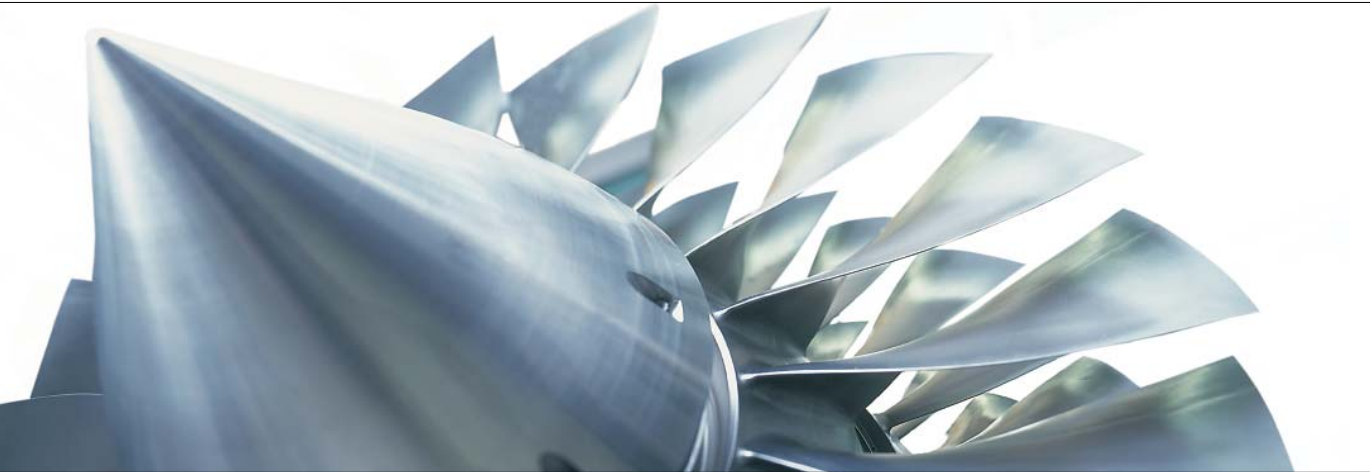
Adaptive machining technology
Adaptive machining technology is used when components are shaped individually and as a result NC machining with "fixed" NC programs is not feasible. This can occur, for example, during the overhaul of worn-out turbine components.

OpenARMS
With OpenARMS (Open Adaptive Repair and Manufacturing Software) BCT provides a flexible solution for adaptive machining. OpenARMS compensates for both individual deviations from normal shape and inaccurate clamping positions. This is achieved by process-integrated or external measuring of the workpieces and data processing to create geometrically adapted NC programs. As a result, each individual work-piece can be machined within the specified tolerances.

5-axis milling, grinding and metal deposition
OpenARMS runs on a PC and is connected directly to the NC control of the 5-axis machine. OpenARMS can be employed to automate a large number of processes (e.g. metal deposition, grinding and milling) for the machining of individually shaped components.

Open concept = your freedom
The choice is yours: you can provide the machining technology yourself or have BCT prepare all the parameter and data sets for your components and machining tasks. OpenARMS allows you this kind of freedom.
The modular OpenARMS concept gives you the flexibility you need to expand your installation by adding applications in the future.
OpenARMS interfaces for NC post-processors and machine kinematics permit operation with a wide range of controls and NC systems.

The Perfect Synthesis of Shape and Position

OpenARMS in the workshop

BCT systems are workshop solutions. OpenARMS has been designed for machinery operators, it is easy to learn and safe to use.

Setting-up in the interactive setup mode

OpenARMS is an innovative and efficient software solution for the automation of adaptive machining. Thanks to its openness and graphic user interface, new machining procedures can be defined quickly in the setup mode:

– The component geometries are read in via standard CAD interfaces such as IGES or STEP.

– The NC machining strategies are accepted via standard interfaces such as CLDATA or in the commonly used NC formats.

– Measuring strategies for capturing individual shape and position are programmed via the integrated CAM measuring module.

– The sequence of adaptive machining processes can be adjusted or altered to suit the particular task at hand.

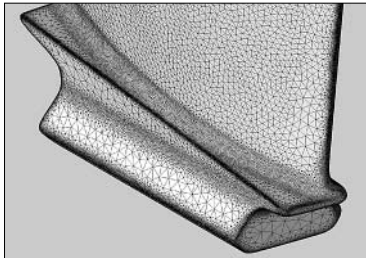## Automated machining in the run mode

Adaptive machining takes place automatically in the run mode – the way you are used to from NC operation. OpenARMS controls the entire automated sequence of adaptive machining including the necessary measurements and calculations. All you have to do is start the machine – OpenARMS does the rest.
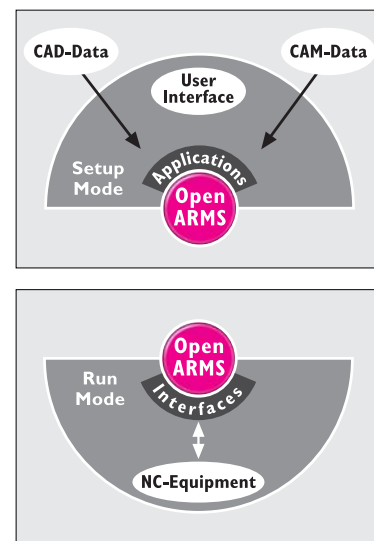
System Integration

Integration of technologies

BCT links individual technology components to create automated complete solutions. BCT's know-how comprises measuring and scanning technologies, data processing and machining processes as well as CAD, CAM, NC controls and fixtures.

Competencies

BCT possesses all the competencies it needs to be a system integrator offering complete systems in the sector of adaptive machining:
– CAD/CAM is the foundation for state-of-the-art machining processes. We are real experts in this area.
– Measuring technology is our stock in trade. In the areas of process-integrated or external measuring and scanning, we have a broad assortment of high-performance systems from which to choose.
– BCT's software solution OpenARMS is a versatile platform for interfaces, data processing and adaptation.
– We are totally familiar with NC controls and PC-to-NC communication. BCT systems can be connected to the commonly used NC controls.
– Our engineering repertoire includes the machining processes of milling and grinding. When developing processes for metal deposition, we collaborate with leading research institutions.
– We join forces with expert partners to build first-rate fixtures.

Modular and turnkey systems

Turnkey systems from BCT have proven their worth at numerous users. Apart from complete integrated turnkey systems, we offer system modules for your existing machinery.

Complete Solutions

Data Management System

CAD · CAM · ERP · Incoming Inspection · Material Addition · Re-Shaping · QA
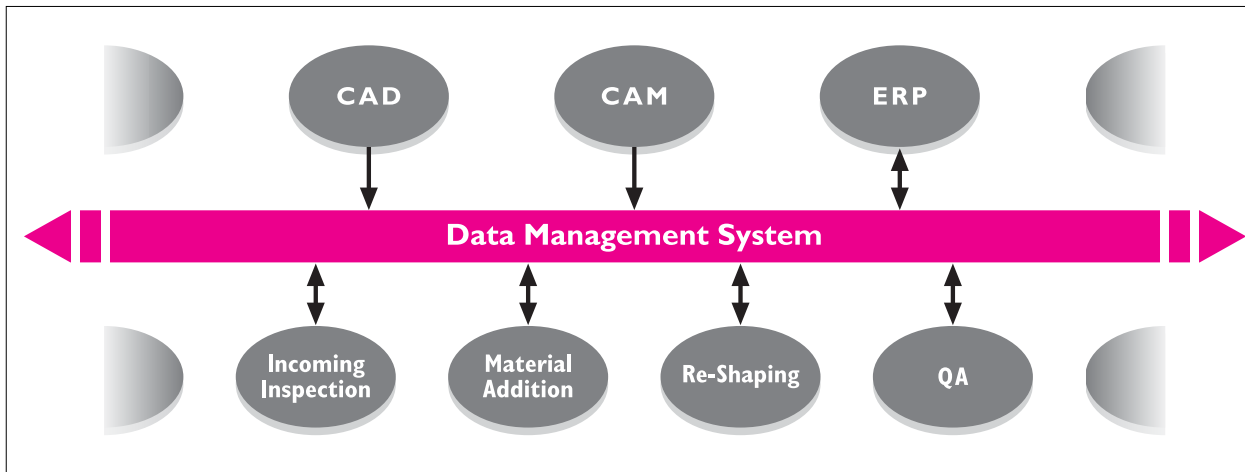
Integration via data management

The linking of processes and systems via modern data technology is the heart of any integrated automated solution. For simple workshop solutions the exchange of single data files is sufficient. To automate adaptive manufacturing processes, however, you need to connect single components skillfully, utilizing data handling technology, to create a complete solution. This is accomplished by the data management system developed by BCT.

During the automated repair of turbine components, for example, the data entered during the initial inspection are available for all subsequent processes. The use of BCT's data management system in adaptive process chains results in enhanced quality and economy.

Inclusion of NC controls

Frequently, communicating with NC controls poses a special problem. In this situation the software module BCT-S-Connect delivers the solution. With BCT-S-Connect the commonly used NC controls can be incorporated in automated process chains.

Engineering and consulting

Our experienced team is there to assist you during the introduction of innovative manufacturing methods and process chains. You can profit from our extensive know-how in this area by taking advantage of our technology consulting and engineering services.

BCT – Your Expert Partner

Are you looking for a reliable specialist for in-process scanning, adaptive machining and system integration? Are you interested in turnkey systems, require custom-tailored applications and appreciate professional support that includes both engineering and consulting? Then you should get in touch with BCT!

BCT has a reputation for automated processes, high accuracy, large throughput, lower costs and higher flexibility.

Put a few challenges our way. We look forward to tackling them for you.

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