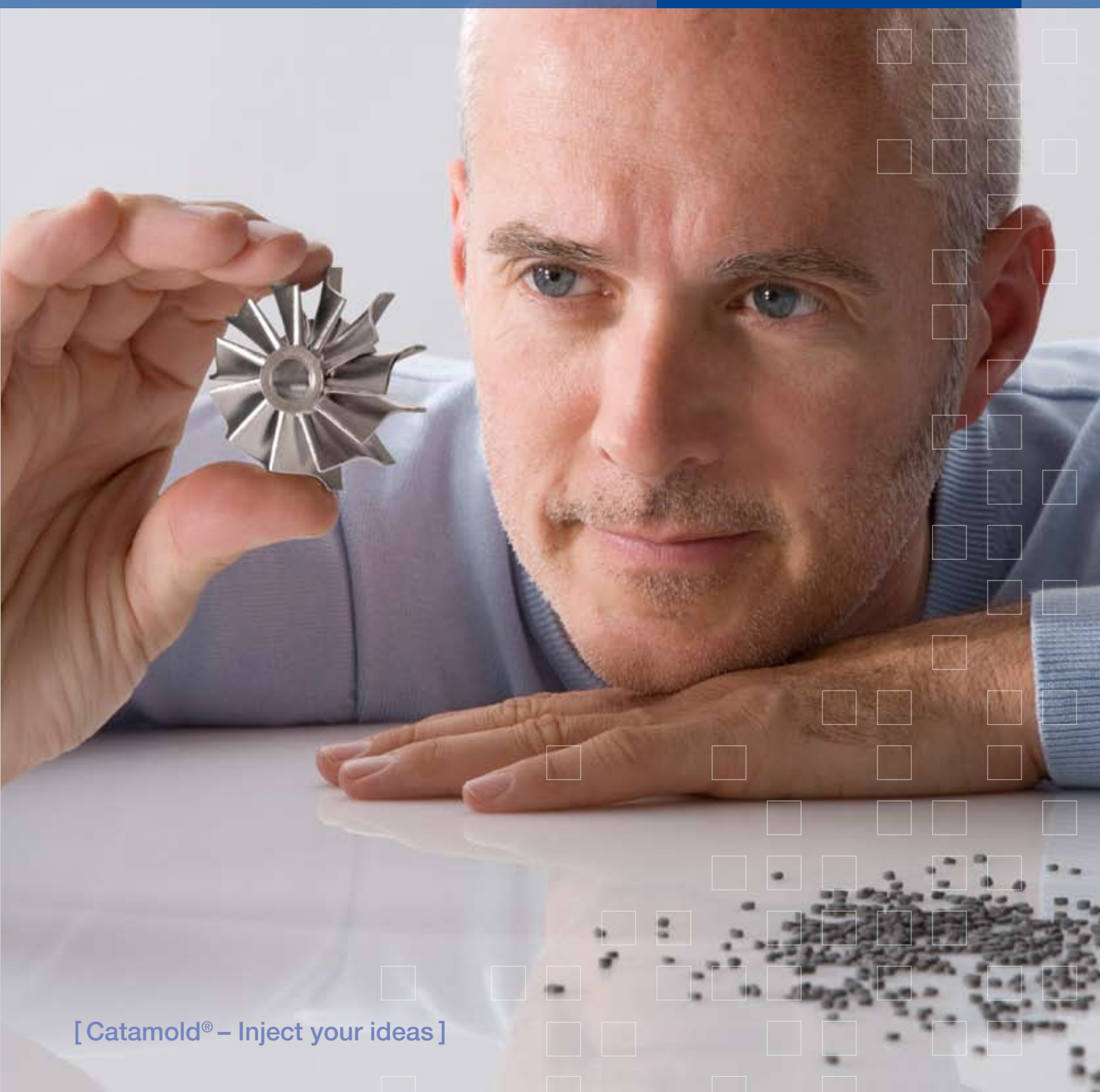
Catamold®
Imagination is the only limit.

Metal and ceramic components made easily

BASF
The Chemical Company



[Catamold® – Inject your ideas]

BASF – innovative solutions for powder injection molding

Discover the amazing possibilities of powder injection molding for the production of metal and ceramic components: with Catamold® and BASF. We have a broad and globally-leading feedstock system. We use a well proven process, have excellent know how and guarantee reliable, on-time delivery. Thanks to our team of chemists, physicists, engineers and business experts, we offer you an all-inclusive package on a global basis, a package which is unique.

Technology: We advise you in the selection of suitable equipment, assist you with start-up and support your further development projects.

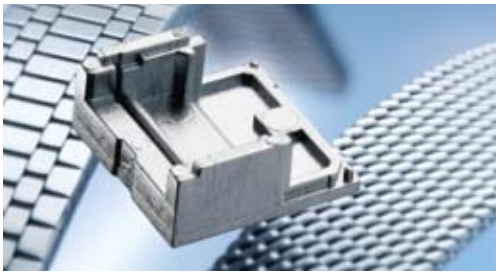
Application: Our application technicians advise you in all aspects of the application: from the selection of a component for powder injection molding to the design of the injection mold all the way to the evaluation of material properties.

Materials development: With our R&D expertise, we advise you in all questions relative to the materials or alloys of specific components.

Demonstration: In our applications pilot facility, you can experience the powder injection molding process with Catamold®.

Component production using the powder injection molding process with Catamold® opens up technical and business opportunities for you. Take advantage of this technology for your success. We'll be glad to help.

Catamold®: A standardized high quality Feedstock for powder injection molding



Catamold® is a process-ready, high quality granulate for powder injection molding. It consists of metal or ceramic powder and a custom (and patented) polyacetal-based binder system. Geometrically challenging components can be manufactured economically with Catamold® on conventional injection molding machines. Metal and ceramic can be injection molded as easily as plastics. The result: new alternatives for the manufacture of complicated components, with economic and technical benefits:

- high level of automation
- wide variety of shapes
- near-net-shape manufacturing
- good mechanical properties

BASF has developed a number of different Catamold® types, which are used successfully in a great many areas and have become a de-facto standard in a variety of markets. For example:

- Automotive
- Consumer Products
- Mechanical Engineering
- Communication / Electronics
- Medical Products

Straightforward production of complex components

Mechanical engineering
Food and beverage industry

Catamold® enables the near-net-shape manufacture of components even ones with complex geometries in metal and ceramic – in large production quantities. As in the case of thermoplastics, many options are available right from the first processing step, injection molding: undercuts, cross holes, blind holes, grooves and threads as well as surface structures and lettering. Therefore Catamold® is the economic alternative to traditional technologies, e. g. investment casting.

Functional integration: Powder injection molding with Catamold® offers manufacturers and users the widest possible scope in the design of workpieces. Instead of achieving functions by adjoining a number of parts, these can be obtained in only one part by means of powder injection molding.

Excellent properties: The fine powders used in Catamold® make it possible to achieve final densities of 96 % to 100 %, depending on the workpiece. This high density together with a homogeneous microstructure over the component cross-section leads to excellent mechanical and magnetic properties and to outstanding corrosion resistance. As a result of the surface quality of the components produced from Catamold®, subsequent machining can be omitted in many cases.

Wide choice: A wide range of materials is available for metal and ceramic injection molding. Our range encompasses typical representatives of the groups of materials: low-alloy or stainless steels, tool steel, superalloy and oxide ceramics.

Details of our full product range can be found in the back pocket of this brochure.

From granulate to component: injection molding, debinding, sintering

From granulate to complex component made of metal or ceramic, Catamold® goes through three basic process steps: injection molding, debinding and sintering.

1. Injection molding

The part is molded (Green part)

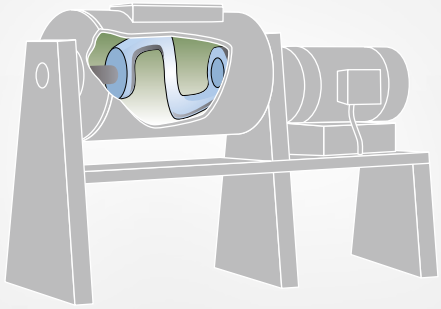
2. Debinding

The binder is removed (Brown part)

3. Sintering

High temperatures give the part its final size and properties (Sintered part)

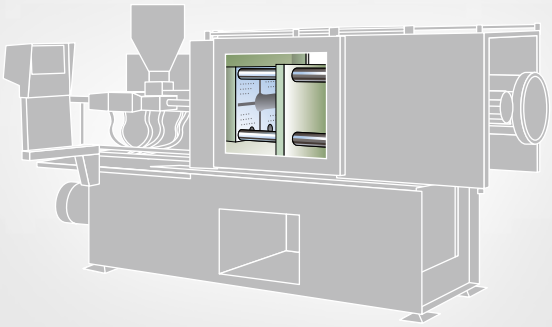
Feedstock production



Process at BASF SE

Manufacture of process-ready granulate from powder and binders.

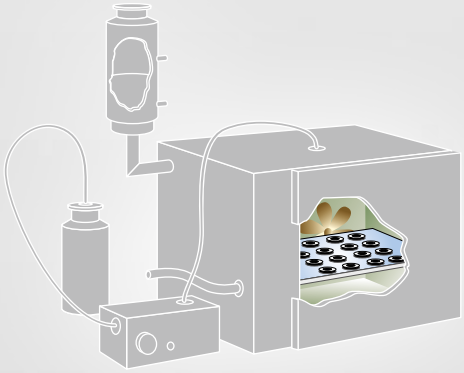
Conventional injection molding machine



Process at customer site

The Catamold®, which consists of granulate (metal or ceramic powder), can be processed without difficulty in conventional injection molding machines. The injection-molded components possess a high green strength, permitting fully automated injection molding even of components with complex geometries.

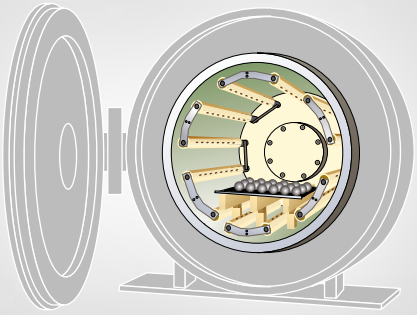
Debinding oven



Process at customer site

Catalytic debinding is particularly rapid, thereby allowing continuous, high-volume processing and offering the associated economic benefits.

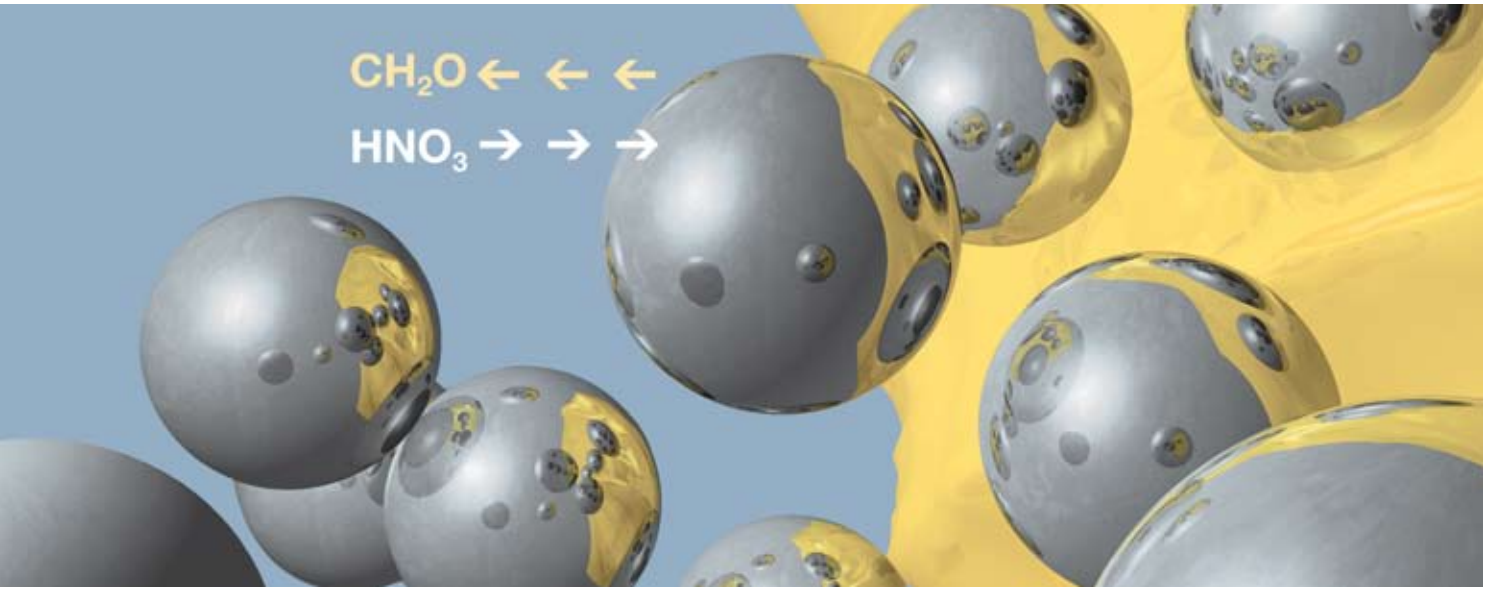
Sintering furnace



Process at customer site

Proven continuous or batch-operated sintering furnaces are available for the sintering process.

Catalytic debinding – an unique principle



Powder *Binder*

BASF has improved the technology of powder injection molding by patented binder systems based on polyacetal. It makes it possible to replace the conventional binder removal process with a completely new one: green parts injection molded from Catamold® are debound in a gas-tight oven at 100–140°C in a nitrogen atmosphere that contains a few percent gaseous nitric acid. This processing exploits the degradation of the polyacetal by the acidic atmosphere, resulting in very short process times. The low temperature prevents the part from softening.

Since the nitric acid cannot penetrate the binder-containing volume of the green part, it reacts only at the interface. Gas exchange is thus limited to the porous zones that are already free of binder. Removing binder from the outside inward in this way prevents the build-up of internal pressure. In the case of parts with wall thicknesses of up to about 20 mm, the binder decomposition front moves inward at a velocity of 1–2 mm per hour. This makes catalytic debinding about ten times faster than conventional techniques.

Guaranteed highest quality

Ready-to-use granules containing powder and binders

Catamold® consists of selected powders that are extensively checked and ensure reproducible properties.

BASF produces Catamold® by combining powders, binders and additives into a homogeneous granulate in a carefully monitored compounding process.

As part of our product development, the mechanical and magnetic properties and the corrosion resistance of test specimens which have gone through all process steps are determined in our research and development laboratories.

All raw materials and final products are subjected to strict quality control and the prescribed specifications are checked.

As part of our quality assurance program, our experts determine the essential data from each production batch, including rheological properties, sintered density and shrinkage as well as the elemental analysis of relevance to the specific material. This is done by injection molding, debinding and sintering a representative number of test specimens. The quality of our products is documented in a certificate for each delivery.

Our Plant and laboratories have been certified to meet ISO 9001 and ISO TS 16949 standards. Copies of certification are available upon request.

CERTIFICATE

DQS GmbH

BASF SE

Quality Management System

ISO/TS 16949:2002

Automotive
In the fast lane

Turbine wheel

Nowadays the average car consists of more than 20,000 parts. And a great many of them are manufactured by injection molding. Catamold® lets you move into the fast lane easily here.

Established applications:

- combustion chambers
- gear box parts
- ignition lock parts
- safety belt adjustment
- reverse gear parts
- latches
- convertible roof
- nozzles
- locks

Gear box part

Pressure sensor

Fuel injector

Consumer Products

Everything you need

Piece of jewelry

Many small things make our everyday lives easier or more pleasant. And small injection molded parts often play a big role. Catamold® offers you everything you need.

Established applications:

- hair trimmers
- watch parts
- precision parts for motors
- knife blades
- sports equipment
- watch cases
- household appliances
- optical industry/glasses
- harmonicas
- scissors
- spice mills

Knife blade

Espresso machine

Harmonica mouthpiece

Mechanical Engineering

Shifting into high gear

Pump component

Injection molded parts enable the demanding functionality needed for all kinds of machines and tools. The unique Catamold® technology makes it possible to manufacture components from metal and ceramic easily and in a wide variety of shapes.

Established applications:

- gear wheels
- nozzles
- locking systems
- textile machinery parts
- threaded inserts
- pump rotors
- handheld tools
- hinges
- levers
- chip breakers / lathe tools
- industrial machinery parts
- thread guides
- parts for sewing and knitting machines

Pump casing

Lock cylinder

Machine component

Communication/Electronics

The right number

Mobile phone

The modern communication systems we've come to take for granted are based on highly advanced electronics. Injection molded parts are making a key contribution in a wide variety of form and functions. Catamold® helps you a level here that is second to none.

Established applications:

- plugs
- blocking device
- socket
- Mobile phone shell
- battery lock and hinge for mobile phones
- ferrule for glass fiber connection
- mobile phone pushbuttons
- disc drive parts
- hinges

Mobile phone shell

Hinge

Battery lock

Medical Technology

An excellent diagnosis

Scalpel

Advancements in medicine are based on, among other things, innovations in medical technology and the refinement of instruments. And injection molded parts make valuable contributions here, too. So it looks as if the prognosis for Catamold® is excellent here.

Established applications:

- laparoscope parts
- orthodontic parts
- surgical instruments
- glucose watch
- scalpel
- insulin pump parts
- coloscope parts
- pump casing
- endoscope parts
- tweezers
- dental instruments

Tweezers

Orthodontic brackets

Part of a surgical instrument

The Chemical Company

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