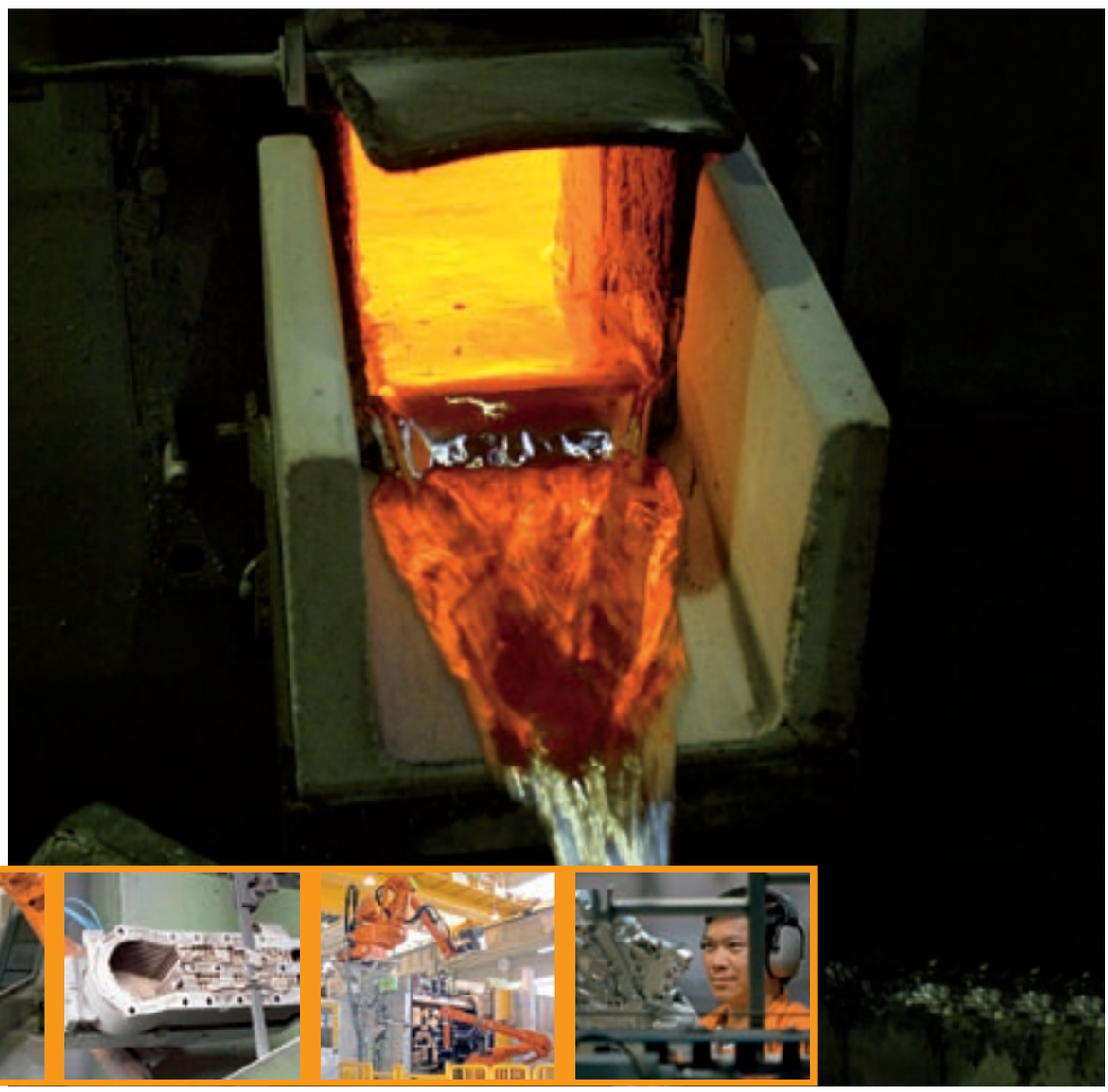
The Right Choice for Higher Productivity

Robot-based Automation for Foundry and Forging

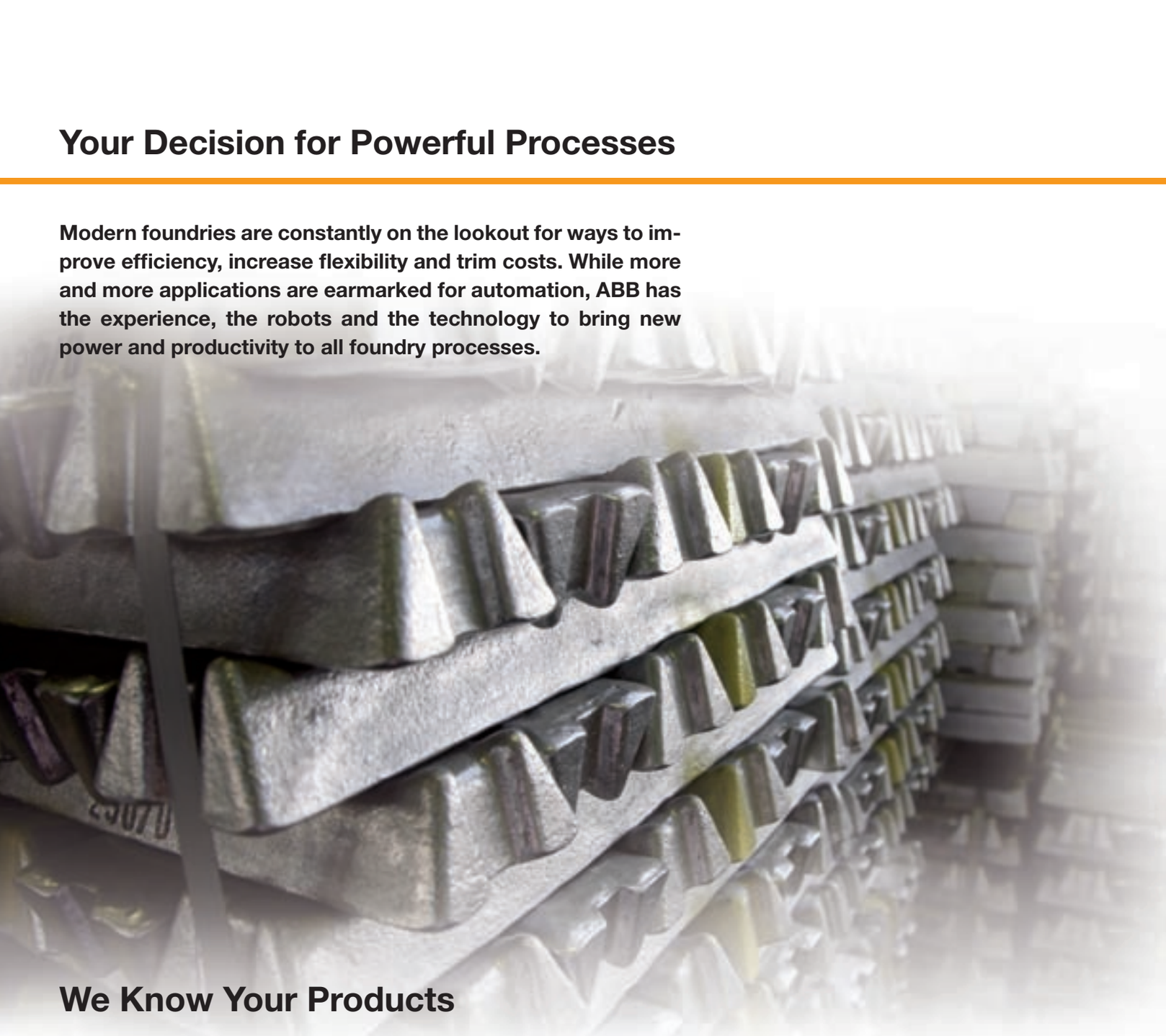


The heart of Robotics

ABB

Your Decision for Powerful Processes

Modern foundries are constantly on the lookout for ways to improve efficiency, increase flexibility and trim costs. While more and more applications are earmarked for automation, ABB has the experience, the robots and the technology to bring new power and productivity to all foundry processes.



We Know Your Products

Electrical
Cases of laptops, mobile phones and cameras

Home appliance and building constructions
Watertaps

Automotive
Engine blocks, cylinder heads, pistons, structure parts

Machinery and equipment
Gearboxes and motor frames, pumps and compressors





Automation is the Key

Robot-based automation can help foundries improve their industrial productivity and remain successful in a highly competitive globalized market. It provides the efficiency needed to maintain existing business and the flexibility to identify and realize new opportunities for growth. What is more, using robots in forges and foundries can significantly improve working conditions in one of the toughest industrial environments imaginable.

Experience Makes a Difference

With 35 years of experience in robot-based foundry automation, there is hardly a challenge or application that ABB engineers have not yet met and mastered. Our dedicated products and solutions are based on profound process know-how and can be adapted to meet individual process requirements. But no matter how complicated or difficult the application is, our robot systems are always as straightforward and easy to use as possible.

We Believe in Partnership

Strong, highly specialized partners are essential for providing our qualified solutions and services to the foundry industry. This is why ABB is committed to support globally active system integrators, OEMs and machine builders with reliable, innovative and easy-to-integrate technology. State-of-the-art robots, software, engineering service and training solutions are all part of ABB's global partner program. Together with our partners we develop the new production concepts and processes that shape the future of robot-based foundry automation today.

ABB Robotics
CERTIFIED
Partner

Marine industry
Pumps, marine screws

Medicals
Implants, surgery tools, artificial joints, prosthetics

Furniture
Chair feet, fittings

Agriculture
Earth movement machines

Aerospace
Turbine blades, propellers, structure parts

Sand Casting

Today we see ABB's highly flexible six-axis robots with the unique Foundry Plus protection in many handling operations all over the process chain exonerate human labor working in an unsavory and unsanitary environment. More than that, driven by ABB's knowledge and dedicated technology, robots enter in process relevant applications to enhance quality, output, safety and flexibility.

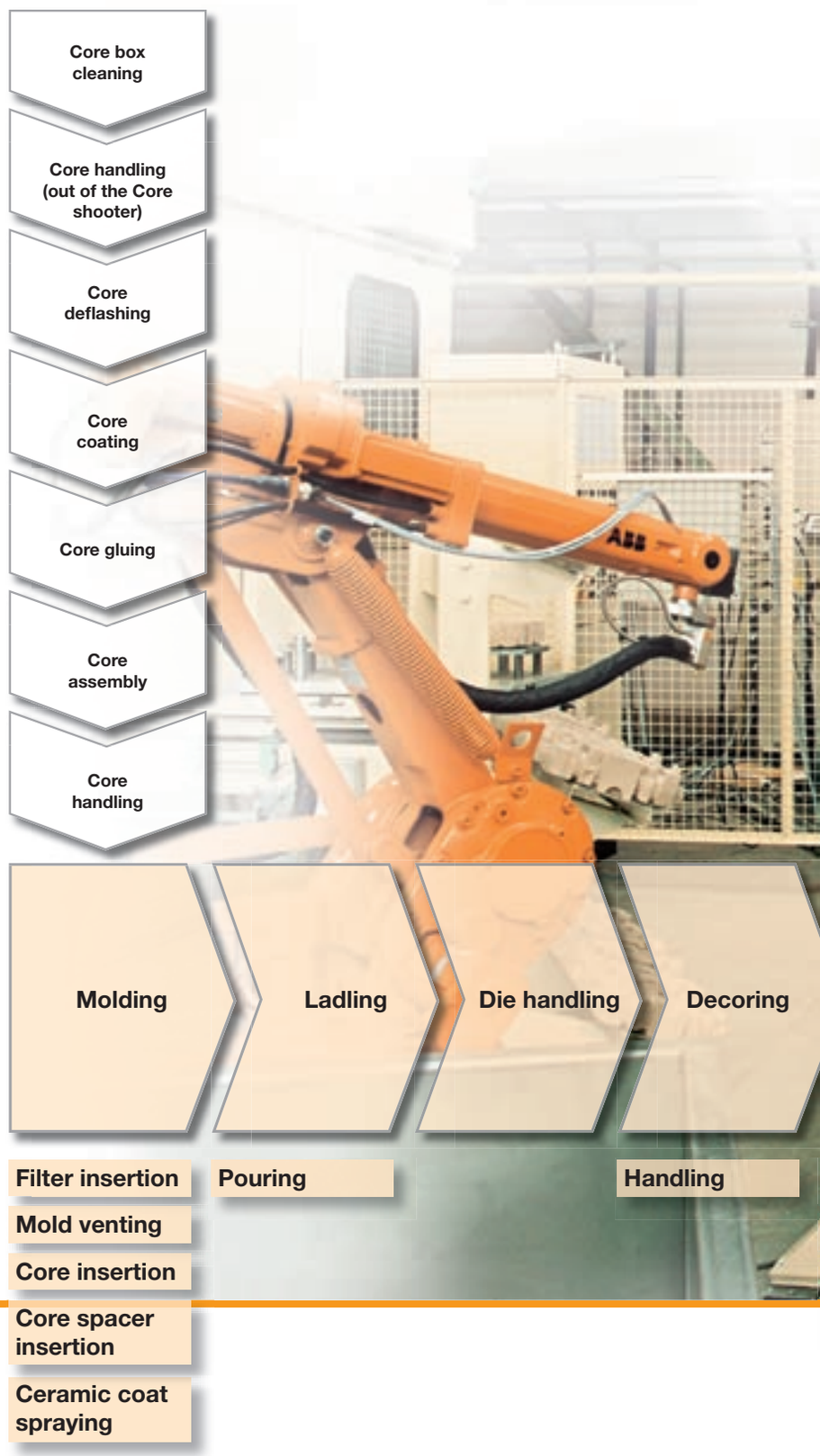
Efficient Core Manufacturing

The gluing, assembly, coating and setting of sand cores are processes requiring excellent consistency and repeatability. Nothing can beat a robot's precision when it comes to the application of the glue or the immaculate and safe assembly of the cores. Optimized quality, short cycle times and reduced materials consumption are only some of the benefits specialized robots like the IRB 6620 can generate.

Homogeneous Castings Require Consistent Pouring

Pouring liquid metal into the molds is crucial to the casting process. Customized robot-based solutions ensure the best possible parts quality by performing constant and repeatable pouring processes with optimized cycle times. The results are homogeneous metal structures with reduced shrink holes. Easy-to-use technology simplifies the teaching process and gives access to the pouring curve. The experienced caster now can fully concentrate on optimizing the pouring process to its best.

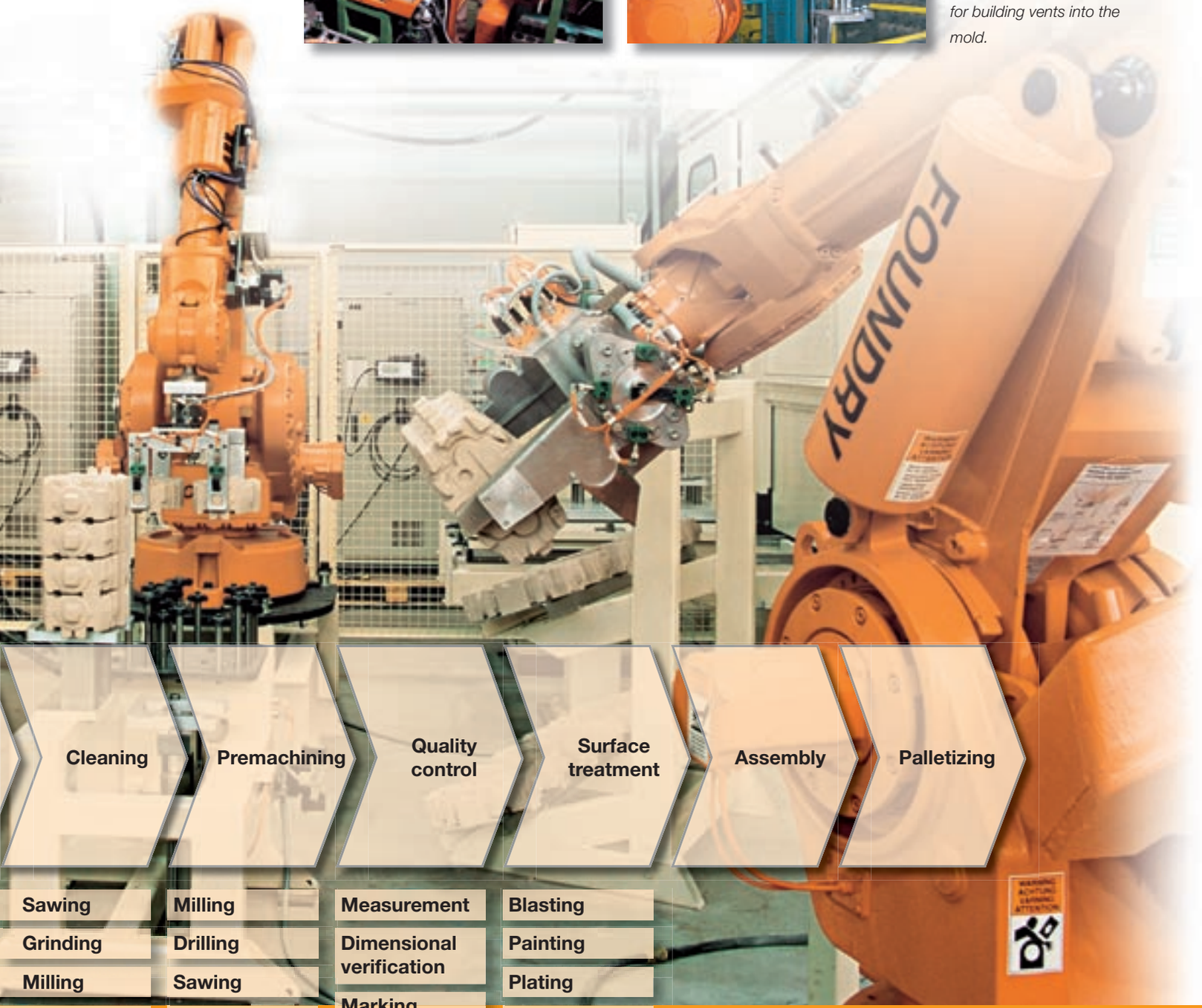
An IRB 140 robot picks up a filter from the stack.



Sand Casting

Fully automated sand core manufacturing process.

A robot-based venting system offers unequaled flexibility and repeatability while eliminating the need for building vents into the mold.



Cleaning

- Sawing
- Grinding
- Milling
- Chiseling

Premachining

- Milling
- Drilling
- Sawing
- Polishing

Quality control

- Measurement
- Dimensional verification
- Marking
- X-Ray
- Leak testing
- Vision

Surface treatment

- Blasting
- Painting
- Plating
- Waterjet cleaning

Assembly

Palletizing

Die Casting

The robot-based automation of die casting processes is rapidly becoming a key factor for success in this highly competitive business. Robots effectively eliminate any weak spot in the foundry chain providing state-of-the-art productivity, flexibility and availability.

Casting a Spell on the Die

With ABB's software RobotWare DieCast, the installation, programming and operation of robots in die-casting cells become amazingly easy. It's a powerful tool for enhancing robot operation and production that simultaneously optimizes availability through rapid set-up, quick error recovery and high reliability. Setting-up RobotWare DieCast is exceptionally straightforward, too: A seven-step programming wizard in combination with the IRC5 FlexPendant control swiftly creates sophisticated machine tending programs to match all production requirements. Pouring and extraction in die casting have never been easier.

Robot-Based Spraying

In addition, customized operator interfaces made with Robot Application Builder facilitate the control of robots in die spraying operations. The operator can monitor the right information at the right time and place. He has access to all relevant parameters to reduce cycle times, optimize spray liquid consumption, according to a consistent process and mold life time will be improved. Less post processes are needed due to better die quality.

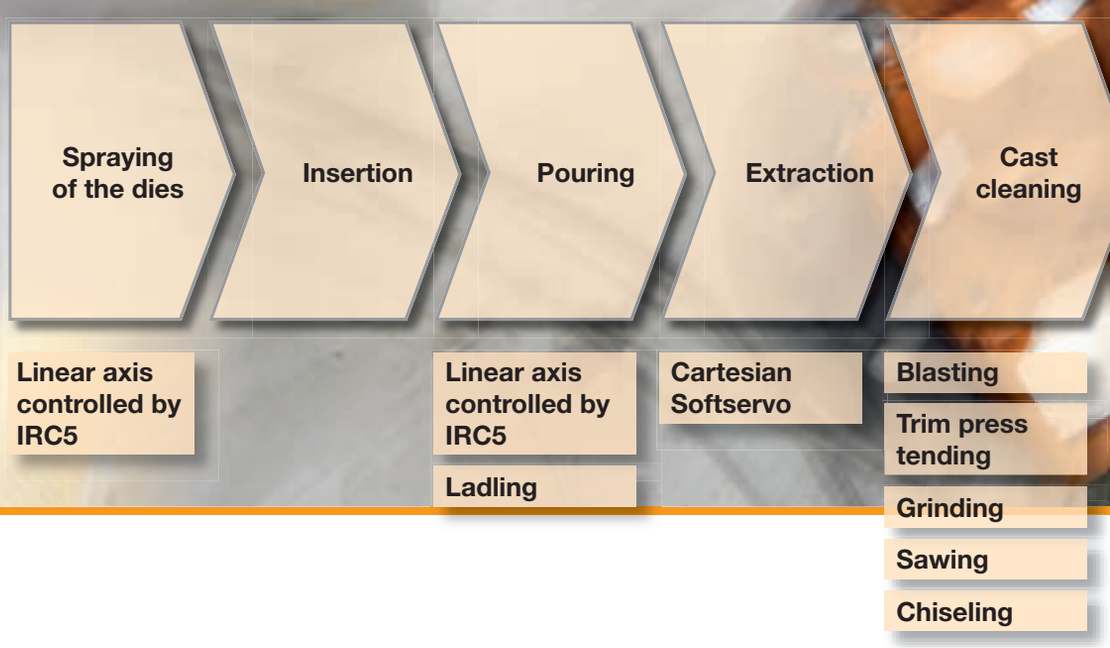
Up to 36 Axes Under Control

Spraying and pouring processes in die casting are often performed by linear systems, each one requiring its own control system. With the IRC5 robot controller's MultiMove feature, a single robot cannot only handle the extraction of the cast parts but also control the linear systems. Using just one control design effectively reduces costs and complexity.

A Clean Cut on Costs and Complexity

RobotWare Machining FC (Force Control) brings change to another well established tradition in die casting: manual cast cleaning. The new dedicated technology removes the bottleneck and greatly increases overall process efficiency.

Robotware DieCast on FlexPendant.

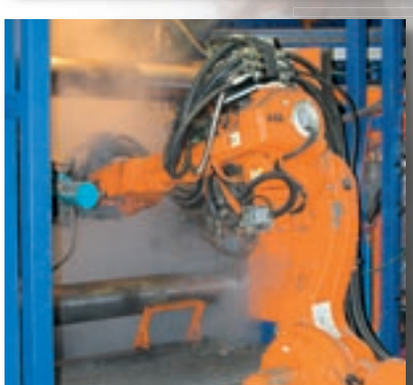


The benefits include:

- Improved process results
  Securely controlled contact force in grinding applications gives an improved and consistent product quality.
- Longer tool life
  Consistent process parameters improve tool life time up to 40% compared to manual operations.
- Reduced programming
  80% faster program grinding, milling and other fettling operations by allowing the robot to feel the surface.
- Short cycle time
  20% faster deburring application as the robot adopts maximum possible speed.
- Ease of use
  Leading the robot through the path by taking it at its "hand" makes programming as easy as possible.

Two advanced software features form the heart of the new functionality. The first lets robots grind, polish or buff castings maintaining a constant pressure between tool and work surface. The second enables robots to debur or deflash at a controlled speed, slowing down when encountering excessive burr. For the first time, robots can be sensitive to process forces in machining applications making foundry cleaning operations much simpler, faster and cheaper.

The new ABB Function Package Force Control for Machining.



FoundryPlus robots operate smoothly in one of the most hostile industrial environments imaginable.

Mounted on the floor, on a shelf, tilted, inverted or on top of a machine: ABB's robot range guarantees a maximum of flexibility for die casting cells.

Machining → **Inspection & quality control** → **Surface treatment** → **Assembly** → **Palletizing**

- Grinding
- Milling
- Sawing
- Drilling
- Measurement
- Dimensional verification
- Marking
- X-Ray
- Leak testing
- Vision
- Blasting
- Painting
- Plating
- Waterjet cleaning

Gravity Casting

Innovations like the TrueView vision guided robotic system or Foundry Prime protection open up new application areas for robots, especially in the automotive industry. By being tougher, increasingly powerful und more intelligent than ever, robots are changing the foundry environment for good.

- Core box cleaning
- Core handling (out of the Core shooter)
- Core deflashing
- Core coating
- Core gluing
- Core assembly
- Core handling

Quality Comes Pouring Down

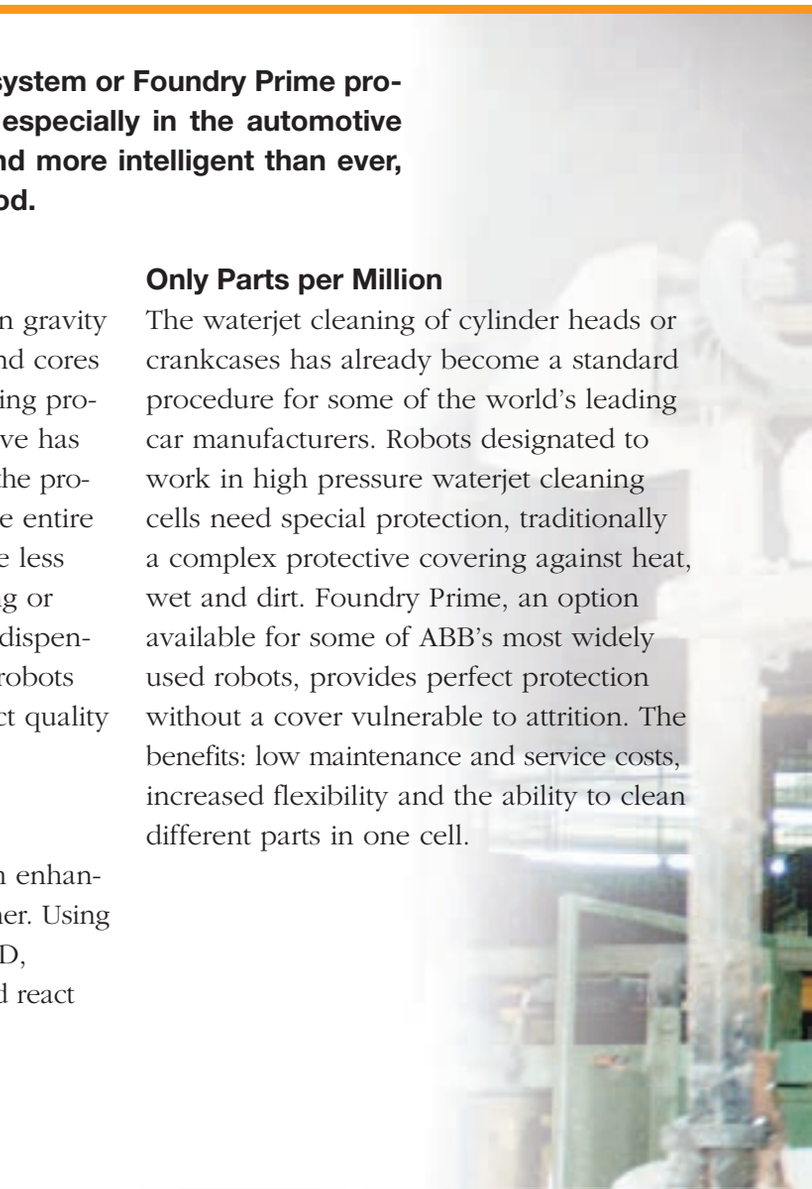
The first steps to superior quality in gravity casting after preparing the mold and cores are highly precise ladling and pouring processes. Once the ideal pouring curve has been identified, robots will stick to the procedure, bringing repeatability to the entire process. Perfectly cast parts require less finishing. Still, the blasting, grinding or waterjet cleaning of the cast are indispensable and yet another area where robots can enhance efficiency and product quality in gravity casting.

TrueView

ABB's vision-guided robotic system enhances our robots' versatility even further. Using a single camera to detect parts in 3D, TrueView enables robots to see and react in a changing factory environment.

Only Parts per Million

The waterjet cleaning of cylinder heads or crankcases has already become a standard procedure for some of the world's leading car manufacturers. Robots designated to work in high pressure waterjet cleaning cells need special protection, traditionally a complex protective covering against heat, wet and dirt. Foundry Prime, an option available for some of ABB's most widely used robots, provides perfect protection without a cover vulnerable to attrition. The benefits: low maintenance and service costs, increased flexibility and the ability to clean different parts in one cell.



Molding	Ladling	Die handling	Decoring	Cast cleaning	Machining	Inspection & quality control
Filter insertion	Pouring			Blasting	Grinding	Measurement
Core insertion				Trim press tending	Milling	Dimensional verification
Mold venting				Grinding	Deflashing	Marking
				Sawing	Sawing	X-Ray
				Chiseling		Leak testing
						Vision

Gravity Casting

Ladling made easy: dedicated robot solutions developed in close cooperation with ABB's specialized partners pour metal with precision.

Surface treatment

Assembly

Palletizing

Blasting

Painting

Plating

Waterjet cleaning

Precision Casting

Investment casting is still a very labor-extensive industry. There are, however, excellent opportunities for automation. With the IRB 7600 power robot, ABB has the right tool combining power and precision for a boost in productivity.

Power Meets Precision

With a steady increase in performance, robots already found their way into applications like shell making or post-production processes like the grinding or polishing of the cast parts. The robot-based automation of wax tree mounting is the next step for progressive foundries looking for new ways to optimize the output and flexibility in investment casting.

The IRB 7600's long-arm version features a reach of up to 3.5 m and a handling capacity up to 500 kg (wrist down even 630 kg) allowing seamless integration with almost any existing production line. Sheltered by ABB's unique FoundryPlus protection including IP 67 tightness, none of the hazardous, alcohol-based slurry can enter the machine while handling the wax trees. Increases in productivity of up to 40 percent guarantee short payback time and an excellent return on investment.

Clean Operation Guaranteed

With new, innovative features like optional filters preventing moist dust from clogging the fans, heat sinks, and air ducts, the IRC5 robot-controller is perfectly prepared to provide state-of-the-art process control in precision casting applications. The highly effective metal mesh or polymeric filters keep all particles and dirt away from the controller's interior and guarantee safe and reliable process operation while reducing the need for maintenance to a minimum.

More output, less downtime: robot-based automation optimizes ceramic shell making.

Pattern and gating system manufacturing	Assembly pattern to cluster	Cluster coating & investing	Metal pouring	Shell cracking	Cast cleaning	Machining
Extraction & handling	Handling & gluing	Handling	Ladling		Sawing	Sawing
					Grinding	Trim press tending
					Polishing	Grinding
						Chiseling


Machine tending
Quality control
Measurement
Dimensional verification
Marking
X-Ray
Leak testing
Vision

Lost Foam

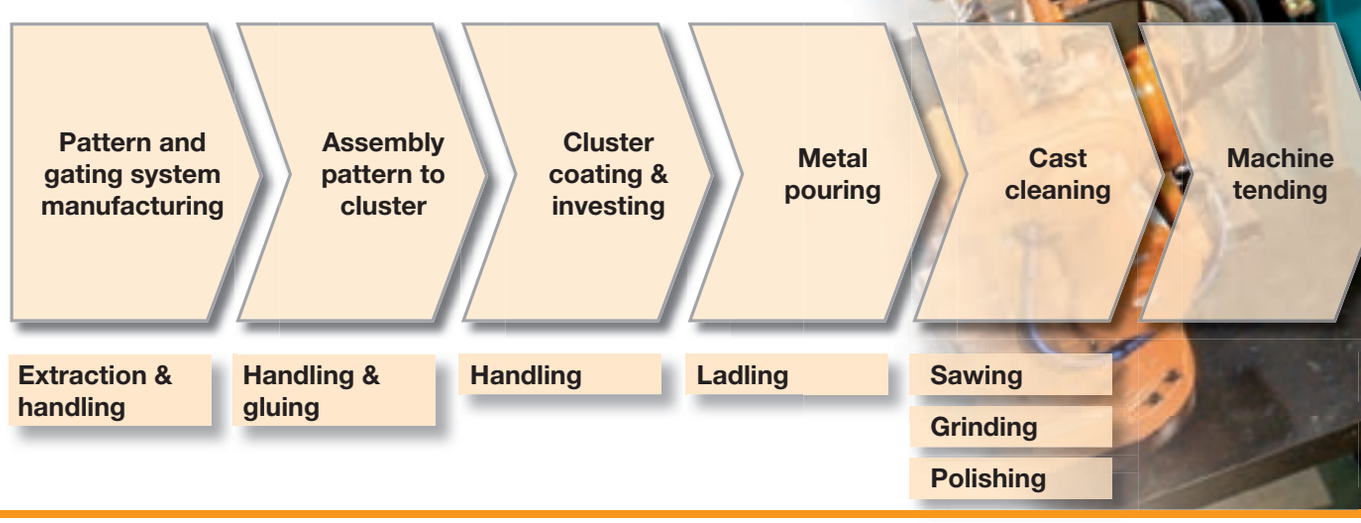
The lost-foam process provides casting designers and producers with opportunities way beyond the possibilities of conventional casting. ABB Robotics supplies the right tools to reduce manpower, improve ergonomics and optimize process control in this new, highly accurate technology.

Shaping Parts of the Future

No cores, no parting lines and no need for de-coring: the main advantages of the lost-foam process lie in the problems that it does not create in the first place. The use of foam patterns to produce a cavityless mold allows the casting of very complex shapes with extremely close dimensional tolerances and well-controlled wall thickness. New designs with multiple parts cast in one and cast-in added features facilitate the production of heavily cored or highly machined parts like cylinder heads, engine blocks, crankshafts or electric motor frames significantly. ABB robots are an ideal choice for coating, cluster assembly, cluster insertion, pouring, extraction, coating removal or finishing applications.

Perfectly Protected and Right on Track

Our powerful track motion systems ensure reliable and effective utilization of the robots by greatly extending their working area, enabling one robot to do several jobs at once. The robot itself is perfectly protected by Foundry Plus or even Foundry Prime, the world's first protective system that effectively shields robots without the need for a complex protective covering. With a special 3-layer epoxy coating, anticorrosive parts and pressurized motors, robots protected with Foundry Prime withstand even the extremely corrosive environment in waterjet cleaning applications.



Foundry Prime protection allows flexible usage of robots in water-jet cleaning of cast parts for the automotive industry.

The lost-foam process is ideal for complex shapes.

Quality control

Measurement

Dimensional verification

Marking

X-Ray

Leak testing

Vision

Forging

Automating processes in extreme environmental conditions require the type of know-how that can only be gained by experience. High investments in equipment require best efficiency. With a base of thousands of installed robots, ABB is a global leader in turnkey robot-based forging automation.

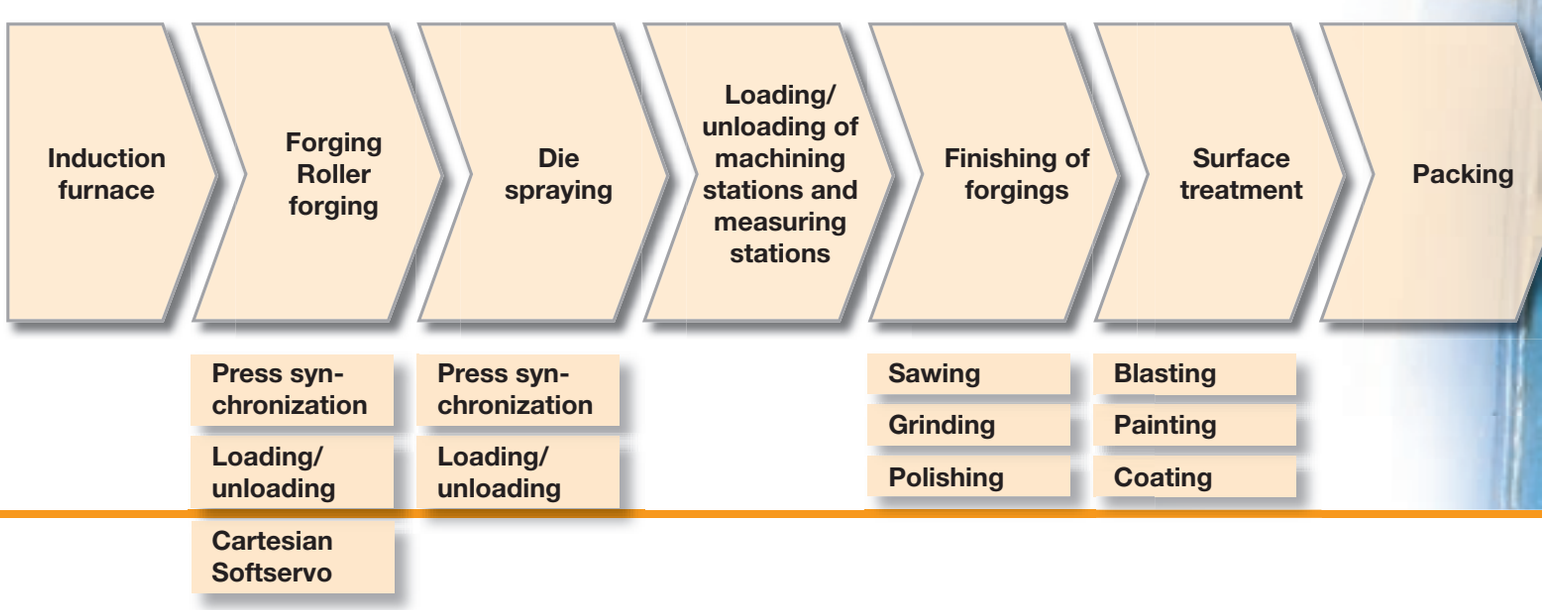
Robotized production flow in a forging operation.

Getting a Grip on Forging

Extreme heat, pollution and noise turn forges into one of the toughest workplaces imaginable – and an ideal environment for robot-based automation. With their availability of up to 98%, ABB's robots contribute significantly to the overall plant availability in forges. Only smooth and continuously running processes can guarantee repeatable results and a consistent temperature profile that reduces the wear of the tools involved. Highly specialized software can ensure the exact deposing of parts with alternating forms and prevent expensive tools from breaking.

Heat-insulated gripping tools made of special materials can cope with extreme conditions such as temperatures of up to 1300 °C and handle parts weighing well over 300 kg. Most robot grippers are custom-made solutions designed to meet the individual requirements of specific processes. Depending on the application, they can be operated either pneumatically, electrically or hydraulically. All grippers guarantee repeatable part insertion and consistent processes resulting in constant part temperatures and defined metal structures.

A consistent process with individually optimized spray technology provides a smooth temperature pattern with positive impact on die lifetime and part quality.



The heat is on: Forge rolling applications require heat-insulated gripping tools.

Palletizing

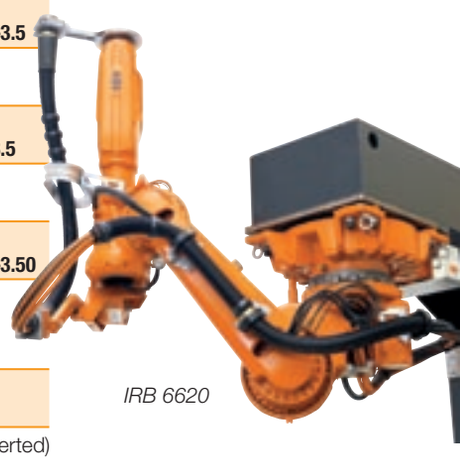
Products

Robots

	Application for foundry	Load (kg)	Reach (m)
IRB 140*	Assembly, Spraying, Cleaning, Finishing, Machine tending Picking & Placing of small castings	5	0.81
IRB 580	Paint robot for paint application for example aluminum wheels or 3C magnesium casting. Available as pure product or as paint application package.	10	2.5
IRB 660	Palletizing of medium to large finished castings, Handling of ingots	180–250	3.15
IRB 1600*	Assembly, Light cleaning, Spraying, Machine tending, Materials handling	5–7	1.2–1.45
IRB 2400	Assembly, Spraying, Grinding, Cleaning, Finishing, Polishing, Mold venting, Machining, Machine tending, Materials handling	5–16	1.5–1.8
IRB 4400	Assembly, Spraying, Grinding, Cleaning, Finishing, Polishing, Blasting, Sawing, Mold venting, Machining, Machine tending, Materials handling, Waterjet cleaning, Quality control	10–60	1.95–2.55
IRB 4450	Spraying, Cleaning, Finishing, Machine tending, Materials handling, Shelf assembly	30	2.4
IRB 6400RF	Machining operation	150–200	2.5–2.8
IRB 6600	Spraying, Assembly, Cleaning, Blasting, Sawing, Finishing, Machine tending, Materials handling, Waterjet cleaning, Quality control	125–225	2.55–3.5
IRB 6620*	Spraying, Assembly, Cleaning & finishing of castings, Machine tending, Materials handling	150	2.2
IRB 6650	Spraying, Assembly, Cleaning, Finishing, Machine tending, Shelf materials handling, Assembly	125–200	3.0–3.5
IRB 6660	High perfomance in machining applications like Grinding, Deburring, Polishing, Finishing, Buffing, Milling, Sawing, Deflashing	205	1.9
IRB 7600	Assembly, Cast Cleaning, Machine tending, Materials handling, Waterjet cleaning	150–500	2.55–3.50
IRC 5	ABB's fifth-generation robot controller. Sets new standards with its modular concept, a completely new portable interface unit and fully synchronous multiple (up to four) robot control through the MultiMove function.		
Flex Pendant	Ergonomically designed portable interface unit with intuitive Windows layout and touch-screen operation.		

* Allrounder (floor tilted or inverted)

IRB 580 for wheel and 3C paint applications.



IRB 6620

Peripherals

Track Motion	Track systems designed to ensure reliable and effective utilization of a robot's capacity by greatly extending its working range. Easily installable base modules of 2 and 3 meters can be extended to up to 45 m by default; longer on request. Low maintenance, automatic lubrication, easy programming, no engineering required.
Motor Unit	Motor units are specially designed for ABB robots and can be used for pheripherals requiring servo-controled motors that are synchronized with the robot movements. The motor units are designed to ensure optional performance and facilitate installation and application.

New generation of track motion.

Protection Features

Foundry Plus	Optional fully IP 67 compliant robot protection for foundry environments. Available for most ABB robots.
Foundry Prime	First protective system working effectively without complex protective covering against heat, wet and dirt in waterjet cleaning applications.
Chip Protection	Effective robot protection for pre-machine environments.
IRC5 Foundry Filter options	Standard: air ducts and fans are fully open for minimized maintenance. Moisture particular filter: metal mesh filter prevents moist particles from entering air ducts and fans. Moisture dust filter: polymeric filter protects air ducts and fans from moist dust.

Software

RobotWare Die Cast	Software product for standard programming convenience maintenance, easy and fast commissioning, man-machine interface for active and simple operations enhance production and quality.
RobotApplication Builder	Software development kit to create customized user interfaces for the ABB FlexPendant or a Windows-PC.
Webware	Offers the possibility to safeguard robot data by scheduling automatic backup and permanent archiving of robot programs, configurations and other product files.
RobotStudio	Powerful offline programming-tool based on the ABB Virtual Controller, an exact copy of the real software controlling the robot in production processes.
RobotWare	RobotWare is a family of controller software designed to sharpen your robots' performance. Basic functionalities: RAPID-Language, ABB Motion Technology, TrueMove, QuickMove, additional axes, Soft Servo, security and safety, error handling, I/O-System, User Authorization System, System Property Browser and additional several RobotWare options.

Robot Application Builder

Function Packages

FP Force Control for Machining	Pre-engineered function package for machining operations including RW Machining FC, axis computer,DAQ Board, Force/Torque sensor, cable package, process equipment, e.g. spindle, assembled, tested and verified. RobotWare Machining FC is a dedicated software for improved automated grinding and finishing of castings. The function is based on the ABB Force Control concept for efficient, high quality, easy to use surface finishing and deburring. Includes: Surface pressure, speed change and graphical user interface for easy programming. RobotWare Assembling FC is an application option greatly facilitating the use of robots for tasks that need “touch sensing” like assembly, fixturing, product testing, etc.
FlexFinishing Cell	Standardized production cell concept for easy and efficient usage of the Force Control features. It will include all equipment and programming needed to run the customer’s production.
True View	ABB’s vision-guided robotics system combining off-the-shelf hardware and an eVisionFactory software platform into a fully integrated package.

IRB 6660 High performance machining robot.

Dedicated Advanced Technology

Mold Venting	Eliminates down time due to manual changes of traditional vent hole punching system. Flexible robot-based mold venting adapts easily to mold pattern changes.
ManuMat	Robot-based ladling system to provide the natural environment to the worker when teaching the robot pouring the metal.

RW Machining FC

TrueView

RobotWare DieCast

Filter

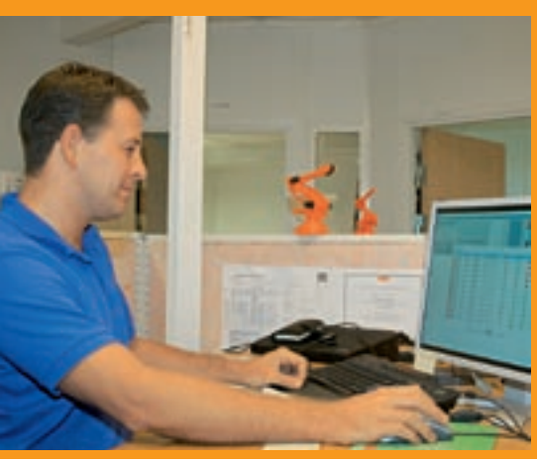
Our Service – Another Key to Your Success

State-of-the-art robot and specific solutions to the foundry industry are not everything ABB has to offer. Our products are backed up and supplemented by tailor-made services or service packages.

Remote Service Keeps Your Robots Running

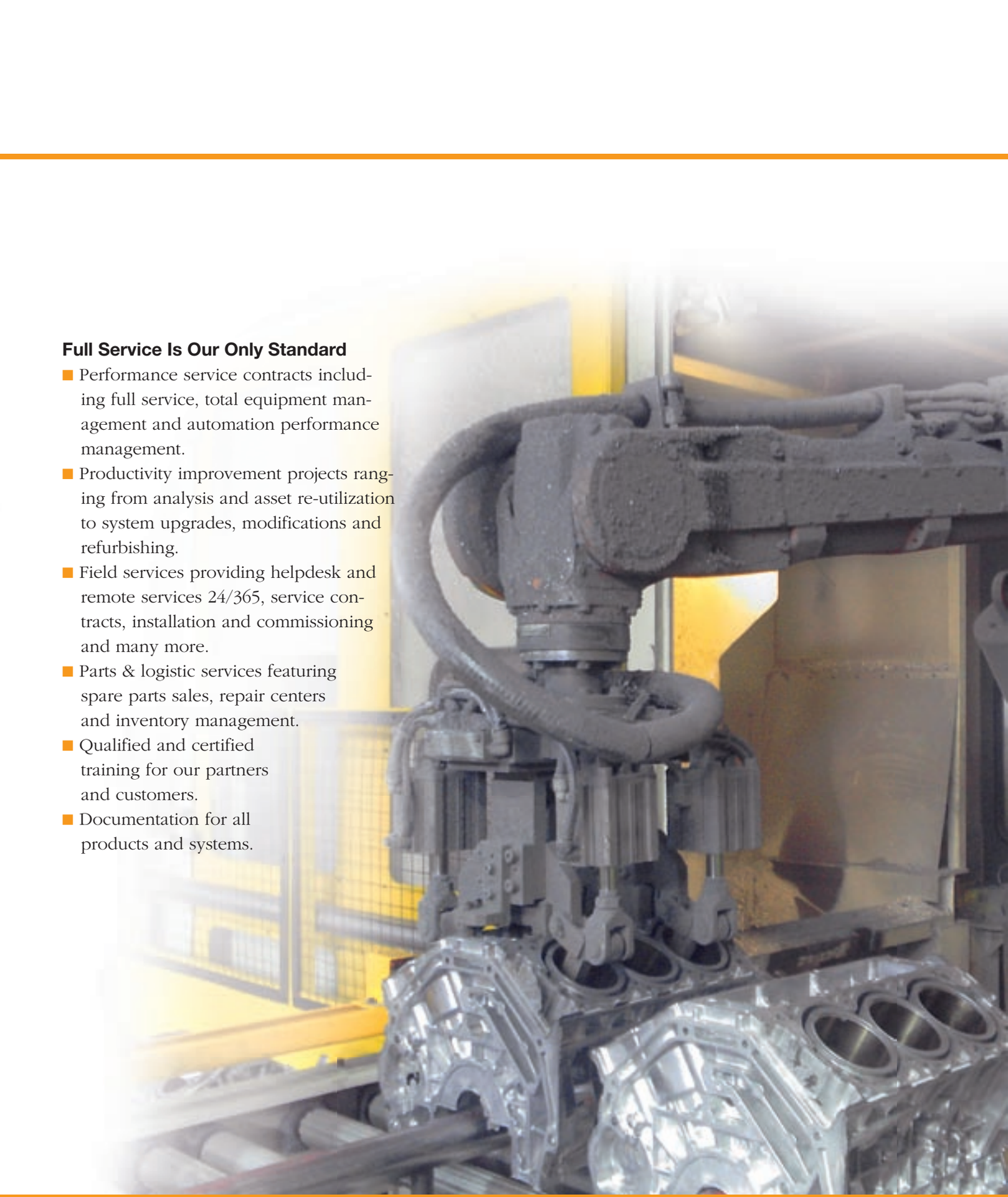
Imagine a service solution where your robotics partner knows that one of your robots will go down soon, before it happens. Imagine a service engineer contacting you to say that he is already on his way with the right parts to fix a problem that might soon occur. Imagine unrivaled availability and productivity with robots running without any unplanned stops.

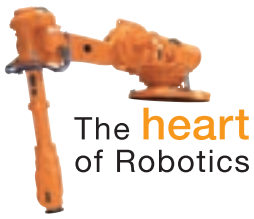
Stop imagining, this is reality and part of ABB's remote service package. And that's not all. All customers with an ABB service agreement can find important information on their robot's status, availability, planned maintenance etc. on a special internet portal and can download maintenance reports, software and all kinds of useful information.



Full Service Is Our Only Standard

- Performance service contracts including full service, total equipment management and automation performance management.
- Productivity improvement projects ranging from analysis and asset re-utilization to system upgrades, modifications and refurbishing.
- Field services providing helpdesk and remote services 24/365, service contracts, installation and commissioning and many more.
- Parts & logistic services featuring spare parts sales, repair centers and inventory management.
- Qualified and certified training for our partners and customers.
- Documentation for all products and systems.





Over the last three decades, ABB has remained committed to building and strengthening relationships with customers, integrators and partners throughout the world.
Underpinning this commitment is our belief that at the heart of innovative robotics lie mutual trust and confidence.
This belief has helped us to achieve clear leadership in a demanding field.
Today, in the automotive, metal fabrication, foundry and plastics industries, our solutions help to pave the way for optimized production. Across the world, our global network of sales and service centres, and our carefully selected partners, make ABB products, systems and services available wherever they are needed.

Welcome to ABB – The heart of Robotics

www.abb.com/robotics

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