

# Sturdy but flexible



To make pre-machining and machining of parts even easier, ABB introduces the IRB 6660 robot, designed specifically for post-casting foundry processes.

> Manual pre-machining of parts means inconsistent quality, more scrap, tough working conditions which make it difficult to recruit workers. So, for forward thinking foundries, the days of manual machining and pre-machining are over. Robots can handle the job, doing it quicker and with more consistency. To make pre-machining processes even easier, ABB has developed the new IRB 6660, the first robot on the market that is dedicated to pre-machining, machining and other post-casting applications for the foundry industry.

The new IRB 6660 robot is perfect for pre-machining and is designed for high-performance applications where robot stability is a key factor for success.

The superior stiffness and robustness of the IRB 6660 allow for high productivity in challenging applications in tough environments. With the IRB 6660, it's possible to achieve a higher removal rate than before, which gives a shorter cycle time and higher productivity. The greater accuracy of the IRB 6660 also makes for consistent and

better part quality, even process forces are high and/or fluctuating. In addition, the relatively heavy robot structure reduces both high and low frequency vibrations.

For machining applications, the best combination is a heavy robot with a light spindle. The high productivity and accuracy of the IRB 6660 increases the application scope of robotized machining, which will save investment costs for the customer, since investments in robots are normally less than in expensive dedicated machines.

RobotWare Machining Force Control, Foundry Plus and Absolute Accuracy are available as selected options for even better performance of the IRB 6660. The IRB 6660 is a combination of ABB's well proven technology and design and along with some new features making it the stiffest articulated robot to date in its class.

This unique combination makes the IRB 6660 very reliable, accurate, cost-efficient and easy to install and maintain, as well as ideal of a wide variety of pre-machining applications. ☉

## >FACTS

### The IRB 6660 at a glance

- 6-axis robot
- Payload: 205 kg
- Reach: 1.93 m
- Protection such as Foundry Plus option and including chip protection - mechanical protection reduces chips entering axis 2
- Complete Robot IP67
- Floor mounted
- Based on selected high-performance components from ABB Power Robots

### Ideal for...

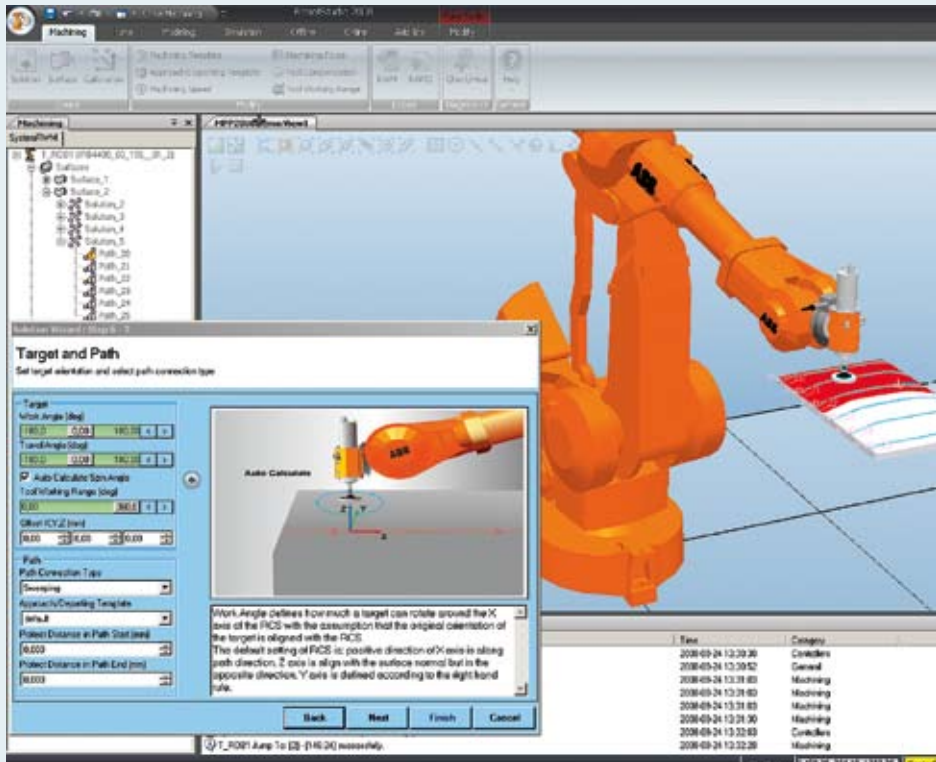
The IRB 6660 robot is ideal for any part – of aluminum, iron and magnesium alloys, as well as other materials – that needs post-processing after a casting operation. Applications include:

- Deflashing
- Degating
- Grinding
- Sawing
- Cutting
- Pre-machining
- Machining

With the IRB 6660, pre-machining is even more efficient than ever.



# Easy automated machining



## >FACTS

### Important features of RobotStudio Machining PowerPac

- Path programming wizard
  - Create/select surface or edge to be machined
  - Set machining process parameters
  - Pre-defined path generation patterns
  - Set path and target parameters
- Path and target optimization and modification
- Path simulation
- Program export as RAPID or RW Machining FC
- Calibration
- Pre-defined and configurable machining templates
- Check/heal CAD models

RobotStudio uses an exact copy of the software used to run the robots in production.

## With the RobotStudio Machining PowerPac, robots can be programmed offline for complex machining operations with less risk – and in less time.

> Machining of parts has long been done manually by the foundry industry – the irregular surfaces and flexibility required were considered best done by hand. But robots are ideal for machining applications, with their ability to work efficiently and provide an unparalleled consistency. To ensure easy robot programming, which is key to optimizing the potential of automated machining, ABB has developed the RobotStudio Machining PowerPac.

RobotStudio uses an exact copy of the real software that runs robots in production, so realistic simulations can be performed, using real robot programs and

configuration files identical to those used on the shopfloor. Time and risks are reduced by programming robots offline, in addition to more accurate paths being created.

Using the Fluent user interface from Microsoft Office 2007, the RobotStudio Machining PowerPac features an intuitive wizard to guide users in creating targets and paths from surfaces and edges quickly, easily and accurately. Pre-defined path generation patterns are provided to support all possible machining types. All process setting such as tool width, overlap rate, machining angles, etc., can be defined in different pages of

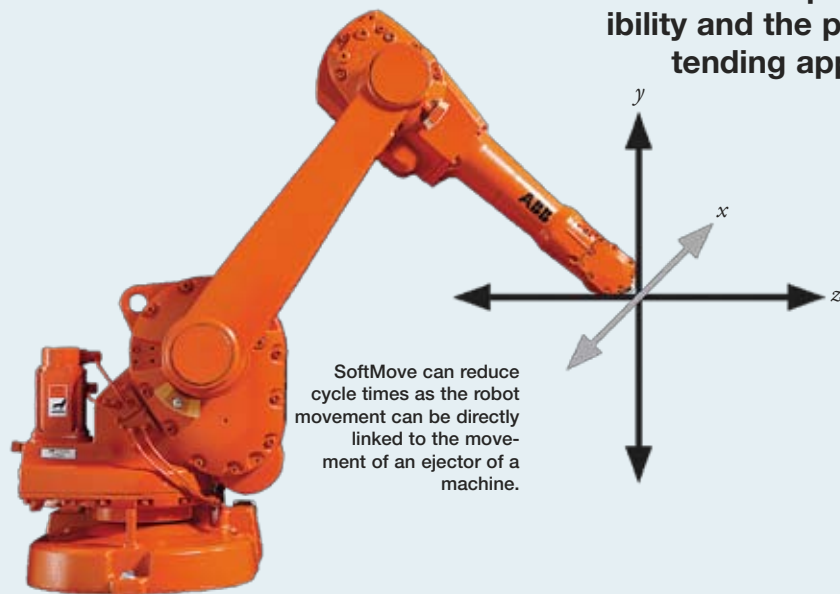
the wizard. All these settings will be used to generate the targets and paths. And wizard pages can be browsed forward and backward to adjust process settings. In the last wizard page, a preview is provided to show how the paths look like before they can be finally created.

The PowerPac includes three machining templates as default: NormalProcess, FC (Force Control) PressureProcess and FC SpeedChangeProcess. All of the parameters in the templates can be customized and re-used among different cases.

Because the Machining PowerPac supports force controlled processes, it works seamlessly with ABB's software for force controlled machining, RobotWare Machining FC, and the program generated in Machining PowerPac can be imported into and recognized by RobotWare Machining FC. ☉

# Compliant and floating at the same time

**New SoftMove software eliminates the need for mechanical compliance solutions and opens up flexibility and the possibility for a variety of machine-tending applications for the plastics industry.**



SoftMove can reduce cycle times as the robot movement can be directly linked to the movement of an ejector of a machine.

> Robot compliance is key for producing precision aluminum, iron or other metal parts, but traditionally it has been solved with a mechanical compliance mechanism between the tooling and the robot's mounting flange. However, mechanical solutions leave little room for flexibility and require high-accuracy fixtures and advanced programming, which can be expensive and require specialized staff.

To eliminate the need for such solutions, ABB has developed a software option, SoftMove, that allows the robot to be compliant or floating as needed in order

to adjust to external forces or variations in work objects. SoftMove means investment costs can be significantly reduced while reliability increases. The flexibility the software provides also allows smooth and inexpensive changeovers when introducing new parts. This can be used in a typical machine tending application where the injection moulding machine ejects a part.

**With SoftMove**, the robot is compliant in one direction only, which facilitates high accuracy and reliability. The option reduces robot programming time and enables


efficient interaction between robot and machine, which ultimately reduces cycle time and saves money.

The robot can be set to be compliant in one Cartesian direction, either during a programmed movement or while standing still. The robot can either be floating or acting like a spring, which facilitates flexibility and multiple application possibilities. Then, when the robot is in floating mode it will be "free floating" in the specified direction and the position can be changed by external forces.

In spring mode the robot acts like a spring in the specified direction and the force needed to push it away increases with the distance from the start point. The compliance shortens programming time and improves productivity and quality.

SoftMove is a true Cartesian soft servo that considerably reduces programming time compared with conventional soft servo functionality. As the robot can be set to be soft in any Cartesian direction, know which robot axes move in a linear movement is not necessary. SoftMove is ideal for simple assembly applications where some compliance in the robot is needed.

**SoftMove is suitable** for any application where the robot needs to be compliant to accommodate changes and tolerances created by tools, machines, fixtures, etc. It is also effective for applications where robot positioning needs to be adjusted due to variations in work objects, inaccurate fixtures or machines, or when the process requires compliance to be more productive and reliable.

Ultimately, SoftMove can reduce the cycle time as the robot movement can be directly linked to the movement of an ejector mechanism of a machine or other external forces. 

## > FACTS

### Features and benefits of SoftMove

- Lowers the stiffness of the robot in a specified Cartesian direction while mainly maintaining the original behavior in other directions
- Robot can be "free floating" in a specified direction
- Robot can have a spring function in a specified direction
- Stiffness and damping parameters controlling the compliance
- Gravity compensation – The stiffness can also be lowered in a vertical direction
- Benefits include compliance in only one direction

The newest innovation in cleaning and deburring is not only friendlier on the environment, it saves costs as well.

# Clean and green wash

> For as long as manufacturers have been drilling and grinding metal, they have faced the problem of burrs, grit and cutting oil left behind after the machining operation. This unwanted material has to be removed, and industry has always gritted its teeth in frustration at the cost, time and mess associated with part cleaning.

Assuring this washing/deburring operation is done well has become ever more critical, especially with high-precision cylinder blocks and other engine components of modern automobiles. Just one small burr could damage the engine right after assembly, requiring a rework of the part and jeopardizing the long term durability of the engine.

In the late 1990s ABB examined the large, inefficient washers then being used and committed engineering resources to finding a better way. Existing washers were inline single-path chemical systems that were large, energy gulping, unreliable and wasteful. The result of ABB research was a brand new generation of robotic flex washers that have revolutionized high pressure water deburring.

**Jan Nielsson**, ABB's FlexWasher Global Product Manager, ticks off an impressive list of benefits and improvements for the FlexWasher: decreased exhaust emissions, low and best-in-its-class noise level and cleaning capability, unequaled reliability with robust, low-maintenance components, and a simple setup that allows for quick reprogramming.

Says Nielsson: "What's unique about our systems is that we're using pure water. With your dishwasher at home you heat your water and add detergent to achieve a good cleaning. With our equipment, we have taken out the detergent and heat while achieving better cleaning than our competitors."

That superior cleaning without chemicals is achieved by combining an exact path velocity and precise water-jet attack angle to

the surface of the part, made possible using a robot-held nozzle moved around the part or a robot-held part moved around a stationary nozzle.

**Even while the FlexWasher** design allows for processing of formerly unreachable areas of complex parts, the entire operation provides great benefits for both the environment and the manufacturer's pocketbook.

There's no energy outlay to heat the water, which is filtered and reused in the closed loop system. An efficient design means less power consumption, and there are decreased exhaust emissions since water vapor is the only byproduct.

Jan Nielsson points to stunning statistics on the operational cost of ABB's FlexWasher versus ultrasonic, injection-flood and fixed-nozzle washers.

With significant savings in power draw, fresh water usage, waste processing and zero chemistry outlay, the FlexWasher's annual operating cost is an amazing 87 - 93 percent less than these other systems.

ABB continues to supply auto manufacturers with custom-built FlexWasher systems while expanding its reach into the aviation industry and other production processes. ☉



ABB programmer Sam Smith testing the new FlexWasher cell before it goes to a customer.

# The do-it-yourself vent

**By doing away with the cumbersome need for vents built into moulds, time and money can be saved.**

> Sand casting is a technology that has been around for millennia. But the needs for today's sand casting in foundries are anything but old. In cutting-edge foundries, much of the production of sand casting has become automated, protecting workers and improving productivity.

A key issue is dealing with ventilation of the mould so that air or gases generated by the process can be released efficiently and safely. Traditionally, this has been done by creating moulds with vents in them. The downside is that not only does this create extra work, but it means a break in the model contour caused by cutting from the back of the mould. The resulting piece can then require extra cleaning to remove material left by the break.

However, ABB has created a new cost-effective solution that removes the need for pre-vented moulds. With ABB's new FlexMouldVenter, it's easy to create vents regardless of the mould.

**The system uses** an IRB 6620 robot, with a special punching head integrated onto the arm of the robot. The robot, which is positioned next to or over the mould, punches vents into the mould from above (model side), or can even cut from any angular direction. The cycle time for creating the vent is approximately one second per hole. The vents are 5-10 millimeters in size, and the precision is better than 1 millimeter. In addition, there is force supervision and if the needle bends or breaks, the robot checks for this after the cycle by moving to a needle-check station. The robot saves the position data for the form so it is possible to apply exactly the same vents for another

application. Each form type may have different numbers of and/or positions of the holes.

There are many possibilities for upgrading as well. And the benefits are many: Reduced complexity of the system saves money since application-specific cutting devices are not necessary, for example. Time can be saved due to the simple programming via the graphical interface. Online processing also means that production doesn't need to be interrupted for programming. ☉



## >FACTS

### FlexMouldVenter up close

- **Mounting:** Floor, wall or ceiling mounting is possible
- **Mould size:** 1250 x 1000 mm, maximum 1600 x 1900 mm
- **Vent punching tool:** integrated into the robot (7th axis)
- **Vent size:** 5-10 mm available (up to 20 mm on special request)
- **Angular venting is possible:** normally +/-30° with X and Y axis, +/- 90 degrees with Z axis
- **Cycle time:** approximately 1 second per vent
- **Needle speed:** maximum 2.5 meters per second
- **Power:** Punching force of 500 N up to 1400 N
- **Precision:** better than 1 mm
- **Position data** can be saved and transferred from a PLC via Ethernet to the controller
- **Automatic control:** if the needle bends or breaks it will be detected automatically.
- **A needle** can be changed in less than two minutes
- **Upgrading:** Can be upgraded to with integrated measurement of a force of +/- 2000 N
- **Data:** Can also be upgraded to save all data regarding the vents