This method, abrasive particles (usually Garnet or Olivine) are entrained and accelerated in the high pressure waterjet in the mixing chamber. The abrasive waterjet can cut any material (by micro erosion). The water stream does not cause a heat effect on the kerf edge and hence the material is not subject to heat distortion or stress.

Robotized waterjet cutting offers the great advantage of constant quality when deburring and cutting complicated three-dimensional cast and forged parts. In addition to enhanced quality and efficiency, automating the process with robots avoids hazardous and dirty work in foundries, improving employee health and safety. Any material such as steels, alloys, titanium, aluminium, brass and copper as well as composites and fibreglass can easily be cut in three-dimensional shapes.

**Typical industrial applications**
- Deburring and grinding of castings.
- Cutting feeding gates and runners on castings.
- Removing sand core from castings.
- Cutting titanium parts, e.g. fan blades and other jet engine components.
- Rimming composites and fibreglass parts.
- Cutting large metal tubes, including welding preparation.

Abrasive waterjet cutting is now a widely accepted process in industry for machining metals, alloys and composites.

**Limitations of abrasive waterjet cutting**
As with any other process, there are limitations that affect the peak efficiency of abrasive waterjet cutting:
- The jet starts to break up when cutting hollow profiles.
- Multi-layer parts with softer material in between will be “washed out”.
- The jet can not drill blind holes or mill flat surfaces on the work piece.
- Machining medium-sized tubes requires a special “catcher” design.

**Benefits**
- No heat affected zone, hardening or stress in the material.
- Efficient material utilisation, small kerf width.
- Omni-directional cutting of contours.
- Limited cutting force on the part, only simple and cost effective fixtures.
- Rapid and easy prototyping.
- Simple design changes.
- Flexible process allowing just in time manufacturing.
- No secondary finishing is needed.
Designing the system around the part. Criteria such as the dimensions and geometry of the part, location and shape of the contour to cut, access for the cutting head, cycle time limitation, fixture interface, handling operations, running costs, etc... need very close attention in order to propose the best possible solution to a customer.

**Designing the system**

Abrasive cutting is a demanding environment for the mechanical and electrical components of the system. Dynamic Robotic Solutions has great experience in building high quality waterjet systems and we exclusively use robots that meet the IP67 standard. Other critical issues such as the operator’s safety, noise levels, part handling, ventilation as well as collecting the water, abrasive and waste material must be properly addressed to supply the best cutting solution for each individual application. Dynamic Robotic Solutions only offers closed cell solutions.

Cutting Box Abrasive Stationary. This flexible cutting solution equipped with a hanging robot and a stationary worktable offers economic cutting of most parts. It is especially suitable for the foundry industry and for jobshops requiring small to medium capacity production. It is also ideal for research and development applications such as rapid prototyping and destructive testing.

CAD simulations give a competitive edge in the development stage to complete reach studies, path programming and cycle time estimation. Simulation saves time and checks costs to see if a standard solution is suitable or if any optimization is required.

**The major system components**

- Cell with sound insulated walls
- Robot(s): 1, 2 up to 3 in each cell
- Robot control and Teachpendant
- Optional track motion (7th + 8th axis)
- Worktable with catcher system
- Part fixture
- Safety devices
- Ventilation system
- Abrasive cutting head and abrasive feeding system
- Water and abrasive collecting system
- High pressure pump and tubing
- High pressure gauge and safety valve

Cutting Box Abrasive DT. This system is specially designed to cut very large parts such as tubes, vessels and large composite components. The hanging robot is mounted on a gantry equipped with two linear axes to provide a large work envelope. The front and the top of the sound insulated enclosure open wide to allow access to load large parts onto the fixture mounted above the “catcher” tank.