

# ABRASIVE WATER JET CUTTING TECHNOLOGY

## 1.0 INTRODUCTION

Water jet cutting technology is the only possibility on the horizon for high automation in high performance cutting of practically all materials. The main advantage of the technology compared to other cutting processes is in the cold cutting process.

This is utilised where cut - free, metal - cutting and thermal processing techniques provide unsatisfactory results or fail for mechanical or physical reasons. Unlike with thermal processes, all materials are cut without the effects of heat with the water jet. This prevents hardening, warping, dripping slag or amalgamation, as well as contamination by pollutants such as noxious gases, etc. In addition to this, certain materials, above all those with a greater thickness, will not allow for a qualitatively or quantitatively effective cut using thermal processes. So materials like titanium, stainless steels, copper, aluminum, etc., with greater thickness can be cut effectively using water jet. When processing fibre composite materials or minerals, the coherent light beam fails completely, where the water jet cutting technology plays a vital role.

The water jet does not create any direct surface pressure on the material. The mechanical reactions take place on the microscope level. So, despite the high kinetic energy in the water jet, any deformation in the material is avoided and a highly precise cut is achieved without fraying or ridges. The water jet, which is as thin as a hair, creates a minimal incision. As a result of this, there is a much more negligible loss of material than in the case with conventional processes.

Water jet cutting also takes the lead where complex shapes are needed. With the "cold method", sections of every material can be cut out into any shape desired. This technique is supremely suitable for the most multifaceted controlled cuts, sharp angles and beveled edges, as well as minimal inside radii. The ability to start the cutting process at will, as well as direct penetration into the material, allows universal handling when cutting different types of material. Cutting with the high pressure water jet is guaranteed to be particularly environmentally friendly. The cutting process is clean, does not create any grinding dust or grit, shavings, or chemical air pollutants. Optimal utilisation of materials by the thinnest slits or seamless interlacing is also a welcome characteristic of water jet technology with today's prices of raw materials and other material resources.

## 2.0 CUTTING TECHNOLOGY

Water Jet cutting uses high pressure water to cut softer material like rubber and foam. When abrasives are added to high pressure water the resulting abrasive jets cuts harder material like steel, glass, titanium, hard rock, bullet proof glass, ceramics, etc. The high pressure water is forced through a tiny orifice to concentrate high energy in a tiny area to cut. The water is pressurised using an intensifier pump to a pressure of 4150 bar (60,000 psi) and forced through a tiny orifice of 0.15 mm to 0.35 mm diameter creating a high velocity of beam. Textiles, elastomeres, fibrous materials, thinner plastics, foodstuffs, paper, thermoplastics, etc., are cut at a flow velocity of up to 200 meters per minute with a pure water jet.

## 3.0 ADVANTAGES

- Water jets cuts in any direction
- Water jets cuts around tight corners
- Water jet cutting can produce the final part with little or no secondary finishing
- Water jet exerts no thermal damage to heat sensitive material
- Aerospace composites can be drilled and cut without delamination
- Water jets can be integrated with existing gantries and robots
- Water jets do not require extensive part clamping
- Water jet jobs setup and change over is rapid
- Water jets produce no airborne dust while cutting composites

## 4.0 APPLICATIONS OF WATER JET CUTTING

Water jet can cut virtually all the materials such as aluminium, glass, brass, pre hardened steel, tool steel, stainless steel, mild steel, copper, plastic, hast alloy, quartz, ceramic, laminates, composites, flammable materials, leather,

stone, granite, marble, foam, Inconel, titanium, fish, meat, etc., Water jet cutting technology plays a major role following industries:

- ✓ Stone & tiles
- ✓ Aerospace
- ✓ Automotive
- ✓ Artistic & architectural
- ✓ Glass cutting
- ✓ Food cutting
- ✓ Wood cutting



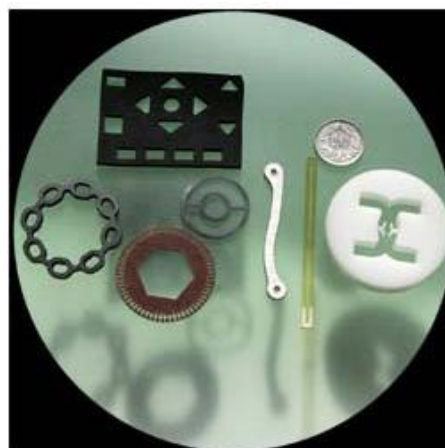
Tile Cutting



Intricate Design



Titanium Machining



Composite Materials



Aluminum Machined Using Water Jet

Courtesy: **Presentation by Shri S Sriram**  
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