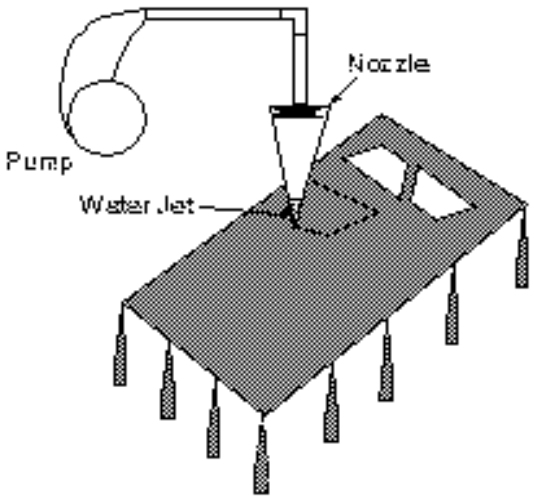
Applied Technology: Waterjet



Concept

Waterjet cutting applies the force of a very concentrated high velocity stream of water to cut through materials ranging from the hardest metals to food products. Special pumps and pressure intensifiers boost the water to pressures in excess of 3400 atmospheres. The water is then concentrated through a metal or sapphire nozzle to a stream diameter of a few micrometers, reaching velocities several times the speed of sound. For cleaning, lower pressures (1/2 - 700 atmospheres) and larger nozzles are used. For very hard materials, abrasives may be added to the water to enhance cutting action.

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Applications

- Cutting; plastic, fiberglass, glass, metal, leather, food, composites, paper, cardboard, rock, concrete
- Cleaning; scale, deposits, coatings, contaminated layers of concrete

Technologies Replaced

- Cutting; by mechanical saw, laser, plasma, or oxyfuel
- Cleaning; by solvents, chemicals, or abrasives

Wastes Reduced

- Metal Cutting Fluids and Contaminated Wastewater
- Slag and Scale; from oxyfuel
- Dissolved Scale, Abrasives, and Solvents; from cleaning
- Material Removal

Potential in Manufacturing

Indust	*SIC*	*Pot*	*Indust*	*SIC*	*Pot*	*Indust*	*SIC*	*Pot*	*Indust*	*SIC*	*Pot*	*Indust*	*SIC*	*Pot*
Food	20	MED	Lumber	24	LOW	Chem	28	MED	Stone	32	MED	**Elect**	**36**	**HI**
Tobac	21	LOW	Furn	25	MED	Petrol	29	MED	Pmetal	33	LOW	**Transp**	**37**	**HI**
Textile	22	LOW	Paper	26	MED	Rubber	30	MED	**MetFab**	**34**	**HI**	Instr	38	MED
Apparel	23	LOW	Printing	27	LOW	Leather	31	MED	**Mach**	**35**	**HI**	Misc	39	MED

Credits: **: Dr. Philip Schmidt and Dr. F.T. Sparrow;**
Unimar Group, Ltd; The Electrification Council; Electric Power Research Institute

Waterjet ***continued***

Technology Advantages

- Fast Cutting
- Clean Cutting
- Cuts Difficult Materials
- Better Tolerances (than mechanical or torch cutting)
- No Thermal Effects
- Flexible and Controllable
- Reduces Material Loss
- Fast Cleaning of Difficult Scale; without solvents or abrasives

Technology Disadvantages

- Higher Capital Cost
- Larger Tolerances than Laser

Typical Costs

Capital Costs	O & M Costs	Potential Payback
$165k - $600k; baseline: $65k - $100k controls: $100k - $500k abrasive: $10k	overall operating nonabrasive: $3/hour abrasive: $11/hr labor: often lower than alternatives	< 1 year or more; very application dependent

Installations

Case A - An automaker installed six waterjet cutting systems on a conveyor line to cut asbestos brakelining strips. Waterjet was chosen because it produces a minimum kerf, < ¼ mm (<0.01 “), eliminates airborne asbestos dust, and is simple to automate for safety and production control. Cutting efficiency increased an estimated 30 - 50% with an annual savings of about $25k.

Case B - An Aerospace firm purchased a waterjet cutting system equipped with hydroabrasive nozzles to cut titanium and other hard materials for aircraft components. The system feeds two cutting stations, one manual for complex contoured components, and the other a CNC X-Y positioning table for sheet metal. The system cuts 1.5 mm (1/16”) titanium plate at a rate of 5 mm/second (1 foot/minute). The company estimates overall production cost savings is 50%.

Major Vendors

Major Vendors

Waterjet

Aqua-Dyne Inc
3620 W. 11th Street
Houston, TX 77008-6004
(800) 324-5151

Ingersoll-Rand
Waterjet Cutting Systems
634 West 12th Street
Baxter Springs, KS 66713
(316) 856-2151

Jet Edge
825 Rhode Island Ave, South
Minneapolis, MN 55426
(800) 538-3343

Pratt & Whitney Waterjet Systems
(cleaning and stripping)
P.O. Box 070019
Huntsville, AL 35807
(800) 239-2773

Robotics Inc.
2421 Route 9
Ballston Spa, NY 12020
(518) 899-4211

Trumpf, Inc.
Large Machinery Sales
Farmington Industrial Park
Farmington, CT 06032
(860) 677-9741

This list of vendors of the indicated technology is not meant to be a complete or comprehensive listing. Mention of any product, process, service, or vendor in this publication is solely for educational purposes and should not be regarded as an endorsement by the authors or publishers.

Index to EPRI DOCUMENTS

Waterjet

Waterjet Cutting, EPRI CMF TechCommentary, Vol 5, No 1, 1988

This information is designed to help you determine **potential** applications for the technology. You are encouraged to contact one of the listed vendors or a consultant for details and pricing.

This manual is not intended as a recommendation of any particular technology, process, or method. Mention of trade names, vendors, or commercial products do not constitute endorsement or recommendation for use. It is offered for educational and informational purposes and is advisory only.

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