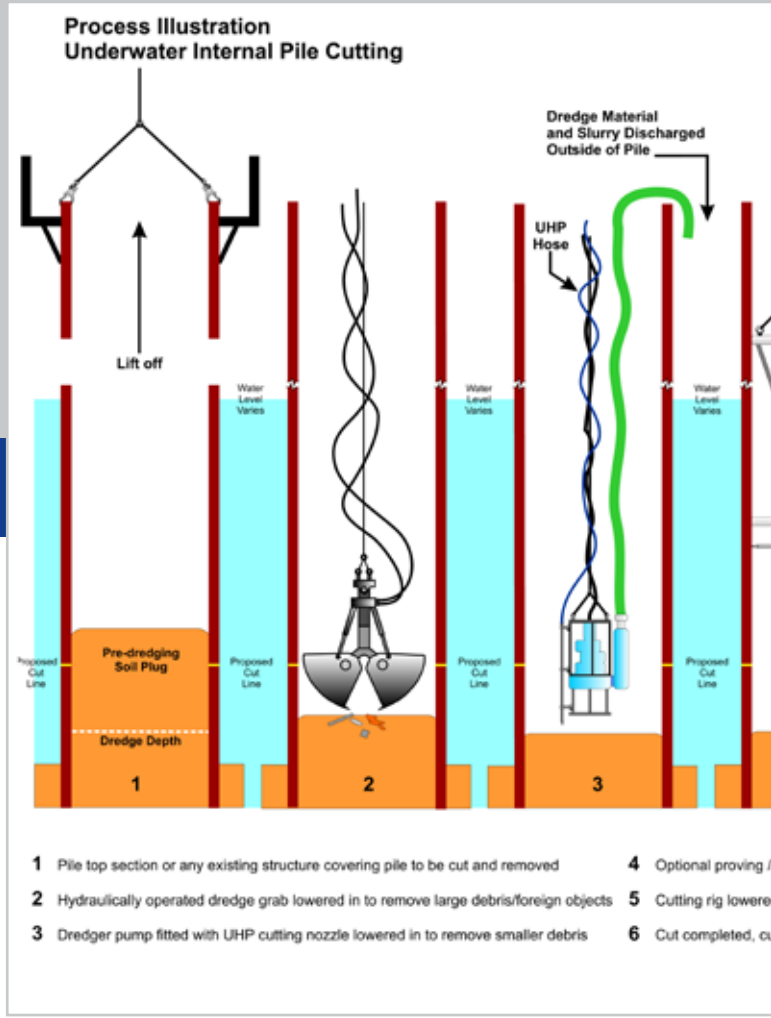
Abrasive water jet:

# Underwater pile cutting by abrasive water jet

GIVING WATER THE CUTTING EDGE

RGL

Successfuly cut and removed pile




## Summary


Abrasive water jet cutting is a specialist automated process that can be used for the remote control cutting of underwater piles to a depth of 50 metres.

This proven application uses internal or external cutting rigs that can be deployed on pontoons, multicats or jack-up barges for the decommissioning of tubular steel piles up to 2m in diameter.

Internal cutting rigs enable piles to be cut at a sub sea level.

For above water applications, concrete can be removed and reinforcing steel can be left undamaged.

It's a technology that is safe and offers substantial cost savings over alternative methods such as diver-operated processes.


## Process overview

RGL uses its own portable, remote controlled cold cutting system (Jetnife) that pumps UHP water through a cutting head nozzle to produce a water jet at 3000 bar/ 43,500 PSI.

At the nozzle tip a small quantity of abrasive media (garnet) is fed at a metered rate into the water stream to produce a high velocity abrasive cutting jet. Crushed garnet is a hard, angular, sharp mineral available in graded sizes. This enables it to pass through a small diameter nozzle without clogging.

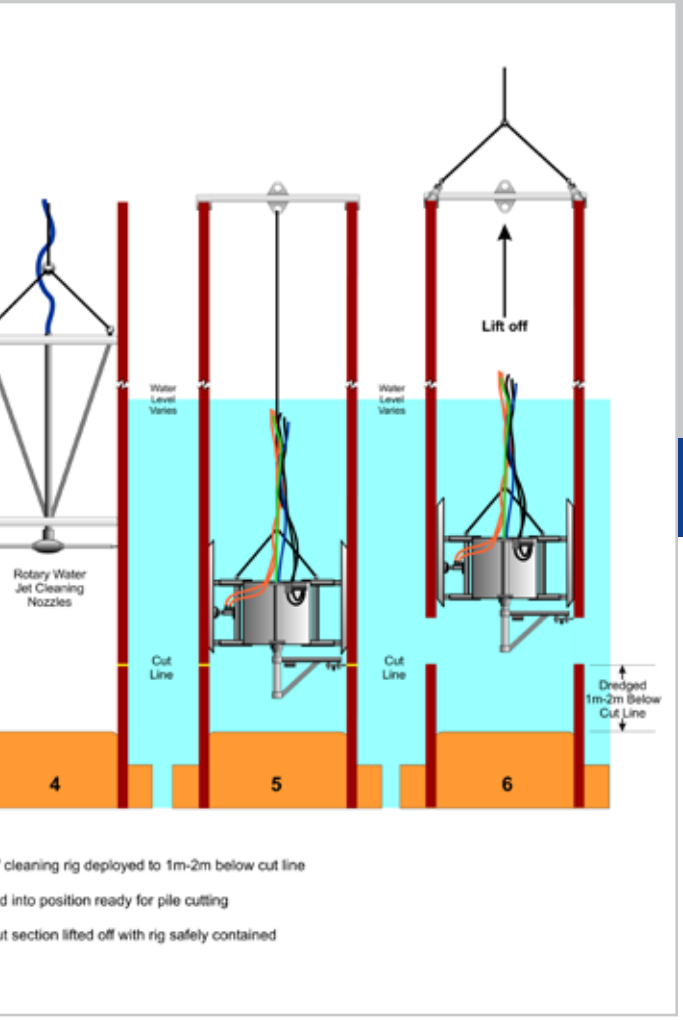
The nozzle is mounted on a semi-automatic rig (designed for either internal or external cutting) and is either inserted into or clamped around the pile being cut to deliver a high degree of cutting accuracy and control.

Our remote control internal pile cutting system enables us to cut off piles below ground/sea level. This avoids the need for costly underwater excavations around the circumference of the pile.

## Applications/experience

RGL's abrasive water jet system is capable of cutting in many situation, where the removal of piles or other structures is required (see chart below).

| RGL experience of underwater pile cutting | | |
|---|---|---|
| North Sea | Meteorological mast | Removal of steel monopole |
| Ellesmere Port | Wind turbine | Removal of steel monopole |
| Tilbury Docks | Marine jetty | Removal of hollow tubular steel piles |
| Riverbed | Ornamental glass house | Cutting of Larssen sheet piles (300mm below river bed) |
| River Tyne | Tunnel | Removal of large diameter temporary circular steel piles |
| Southampton Docks | Marine jetty | Removal of circular steel piles |
| Canary Wharf supporting a building | West India Dock | Removal of temporary piles in a berth construction |




cleaning rig deployed to 1m-2m below cut line

d into position ready for pile cutting

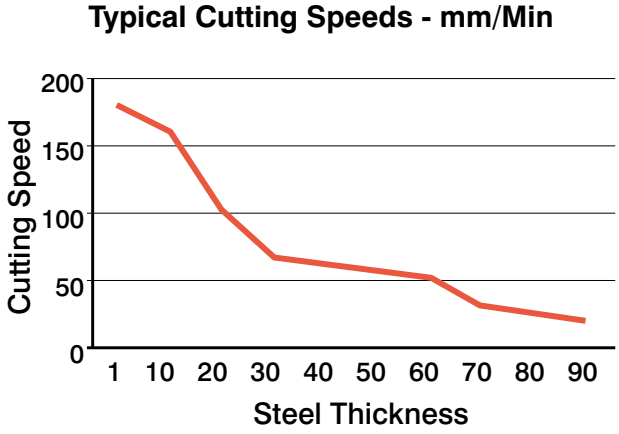
t section lifted off with rig safely contained

External cutting tool being deployed

## Materials to be cut

Abrasive water jet cutting is a proven and effective method of cutting steel and concrete piles. It also easily cuts almost any other material known to man.

## Cutting speeds




## Cutting finish/tolerance

This process delivers a smooth clean cut for demolition, repair and maintenance purposes. Minimal dressing or finishing is required. Mitred/weld preparation detail can be added to tubes if required. Neither does it alter metallurgical properties - no heat means that the structural integrity of the substrate is also preserved.

## RGL's Jetnife equipment and service description

Repairing, maintaining or de-commissioning steel and concrete piles in a marine environment often poses some difficult technical challenges. Whatever the challenge we've got the plant and technology to provide solutions that are effective irrespective of their size, complexity or whether above water, underwater or below bed operations.

- Our portable diesel powered jetting units require a water supply in the region of 10,000 – 20,000 litres per working shift.
- A mains water supply is required (see Client supplied services), we pre-filter to 1 micron before it enters the pump to maintain pump reliability.
- Ultra High Pressure Hose assemblies and connectors link the pump to the cutting nozzle mounted on a modular hydraulic rack and pinion carriage that clamps around/ inside the pile to be cut.
- For internal tubular pile cutting we deploy dredge grabs/ pumps to clear any debris within the structure.
- A proving rig is then deployed to 1m-2m below the cut line.
- We offer a wide range of different nozzle handling devices and associated cutting rigs depending on the type of pile to be cut.
- Where required we design and manufacture bespoke pieces of tooling for specific pile cutting applications.
- Once set up has been completed, a remote console is used to control the movement of the carriage/water jet cutting nozzle.

Cut pile being laid down for safe transportation

## Client supplied services/considerations

This service relies on the provision of client supplied geological surveys and drawings of the structure to ensure that the correct equipment is deployed.

For offshore projects clients need to provide a suitable jack-up barge/multicat to transport RGL pumps and cutting equipment to the work face. The vessel also needs to be equipped with a suitable crane to safely support the pile during cutting operations and subsequently lift and transport the pile onshore.

Abrasive water jet cutting requires in the region of 10,000-20,000 litres of potable water per shift. For offshore projects potable water has to be supplied and stored aboard the marine support vessel.

## Safety

The system is inherently safe. Once set up has been completed, an operator positioned well away from the work surface uses a remote console to control the commencement, direction and speed of the carriage/water jet cutting nozzle.

## Environmental advantages

Garnet is an inert mineral that presents little or no environmental consequences to marine environments. On impact, garnet breaks down into a powder based sludge that immediately separates from the waste water.

## Limitations/risks

This process is currently limited to cutting piles no more than 70 metres underwater.

Internal cutting rigs may not be able to be deployed if there is unknown internal interference within the circumference of the pile that cannot be removed by dredge grabs and pumps.

Marine environments can often be hazardous and unpredictable. The process relies on the client providing support vessels and lifting equipment capable of operating in changeable conditions.

## Comparison summary with competing methods

Abrasive water jet cutting is an efficient and safe alternative to using divers with Broco-type hot cutting equipment.

Diamond wire sawing and air arcs are effective for cutting piles above water but have substantial risks associated with underwater cutting.

Diamond sawing is also complicated to set up and is not suitable for cutting from inside out for tubular structures.

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WJA

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- responding quickly to your enquiries
- working with you to fully understand your requirements
- providing you with the benefit of our experience
- preparing detailed site safety, quality and environmental plans, including method statements and risk assessments
- providing competitive quotations
- delivering on what we promise for project start and duration
- deploying experienced crews and proven, correctly maintained equipment
- working within site safety rules and regulations
- managing the project environment including waste water treatment and filtration
- managing each project through to completion
- COSHH Assessment and measures to avoid adverse environmental impact

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