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Comprehensive Guide:
Hydro Demolition and Water Treatment in Australian Dam Projects

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1. Introduction

Hydro demolition has revolutionised dam rehabilitation projects in Australia. This technique, which uses ultra-high-pressure water to remove concrete and other materials, has gained significant traction due to its precision, efficiency, and alignment with strict occupational health and safety standards. This comprehensive guide explores the benefits of hydro demolition in dam projects, focusing on technology, equipment, safety, environmental management, and compliance with Australian regulations.

2. Hydro Demolition Technology Overview

Hydro demolition utilises water pressurised up to 45,000 psi (3,102 bar) to remove concrete and other materials. Key features particularly relevant to dam projects include:

- Precision control of removal depth and area
- Ability to discriminate between sound and deteriorated concrete
- Minimal impact on surrounding structures and reinforcement
- Significant reduction in dust and noise compared to traditional methods

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3. Equipment for Dam Projects

Aqua Prep offers a range of specialised equipment that enhances the effectiveness and safety of hydro demolition in dam projects:

Aqua Cutter 410A Hydro Demolition Robot

- Designed for confined space applications
- Total weight: 1,190 kg
- Length: 2.1 m
- Min. width: 0.78 m
- Operating height: 3 m
- Working width: 0-1.7 m
- Drive source: Electric Motor 3 Phase 5.5 kW

Aqua Cutter 710 Hydro Demolition Robot

- Unique 3D positioning system
- Total weight: 2,350 kg
- Length: 2.57-2.82 m
- Operating height: 7 m
- Working width: 0-2.45 m
- Drive source: Diesel engine 18 kW / 1,600-2,600 rpm

ERGO GO Hydro-Demolition Robot

- Compact and versatile
- Working Width: 0-2.0 m
- Max Length Between Supports: 2.0 m
- Lance Angle: ±45°
- Max Reaction Force: 1,000 N

Falch Multi Worker 250

- Light, compact, semi-automated water jetting robotic tool
- Maximum reaction force: 60 kg (600 N)
- Dimensions: 610 x 750 x 1,600 mm
- Weight: 89 kg

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4. Benefits of Hydro Demolition in Dam Rehabilitation

- ***Precision and Selective Removal:*** Maintains dam structural integrity
- ***Preservation of Reinforcement:*** Cleans and exposes rebar without damage
- ***Structural Integrity:*** Eliminates micro-fractures in remaining concrete
- ***Versatility:*** Effective on various dam surfaces
- Speed and Efficiency: Rapid concrete removal rates

5. Australian Regulatory Framework and Standards

Hydro demolition in dam projects must comply with various Australian regulations:

- Work Health and Safety (WHS) Act and Regulations
- Safe Work Australia Guidelines
- State-specific initiatives for silicosis prevention and dust control
- Environmental protection regulations

Concrete Waste Disposal Standards

- Protection of the Environment Operations Act 1997 (NSW)
- Waste Avoidance and Resource Recovery Act 2001 (NSW)
- Environmental Planning and Assessment Act 1979 (NSW)
- Australian Standard AS 3648:1990 for recycled concrete use

6. Safety Advantages and Silicosis Prevention

- ***Dust Suppression:*** Reduces respirable dust by up to 90%
- ***Reduced Airborne Particulates:*** Creates wet slurry instead of airborne dust
- ***Lower Respiratory Risk:*** Decreases worker exposure to respirable crystalline silica

7. Implementation in Dam Projects

Hydro demolition can be implemented in various aspects of dam maintenance and rehabilitation:

- Dam Face Rehabilitation
- Spillway Restoration
- Intake Structure Maintenance
- Dissipator Slab Repair
- Chute Block Renovation
- Baffle Block Maintenance

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8. Water Management and Recycling Systems

Aqua Prep has developed a state-of-the-art Hydro Demolition Waste Management System that addresses the unique challenges of water management in dam projects.

System Overview

The system's primary functions include:

- Solid separation
- Slurry separation
- Water separation
- pH reduction
- Clarification
- Discharge options (sewer, stormwater, or beneficial reuse)

Key Components and Functions

- Large-capacity bins for efficient solid separation
- Hook lift tanks for slurry removal
- Self-powered, skid-mounted systems for pH reduction and clarification
- Capabilities for lead and chromate removal

System Performance

- Daily water treatment capacity: over 100,000 litres
- Total suspended solids: less than 3 kg per 100,000 litres
- Water clarity: under 15 NTU (Nephelometric Turbidity Units)
- pH neutralisation

Recycling Efficiency

- Daily water recycling capacity: up to 80,000 litres
- Significant reduction in freshwater demand
- Minimised waste generation

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Vacuum Trucks for Water and Slurry Management

Capellotto 8" Mega Vacuum Truck:

- 10,000-litre sludge tank
- Hibon blower with 6,500 m^3/hr capacity
- Wet/dry baghouse filtration system
- Hydro excavation capabilities

Capellotto 6" Reg Vacuum Truck:

- 8,000-litre sludge tank
- 4,300-litre water tank
- Hibon blower with 2,822 m^3/hr capacity
- Optional air extraction system for dry recovery

9. Environmental Considerations

- Water Management: Advanced treatment systems ensure minimal impact on water quality
- Waste Segregation: Efficient solid separation reduces disposal needs
- Pollution Prevention: Removal of contaminants protects water quality
- Resource Conservation: Significant reduction in freshwater demand

10. ANCOLD Guidelines and Hydro Demolition

Hydro demolition aligns with several ANCOLD principles:

- Risk Management: Supports risk-based approach to dam safety
- Structural Integrity: Preserves reinforcement while removing concrete
- Environmental Management: Supports guidelines on environmental stewardship
- Safety: Dust suppression benefits align with worker safety focus

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11. Cost-Effectiveness and Efficiency

- Labour Costs: Typically requires smaller crews compared to traditional methods
- Material Savings: Reduces overbreak and damage, cutting repair material costs
- Long-Term Benefits: Potential for extended service lives of rehabilitated dams
- Compliance Cost Reduction: Reduces costs associated with dust control measures and PPE
- Water Management Savings: On-site treatment reduces or eliminates off-site disposal costs

12. Conclusion

Hydro demolition, coupled with advanced water treatment systems, represents a significant advancement in dam rehabilitation technology in the Australian context. The precision, efficiency, and numerous advantages in structural preservation, safety, and environmental impact make it an increasingly preferred method for complex dam infrastructure projects.

Aqua Prep's comprehensive solution, which integrates cutting-edge hydro demolition equipment with sophisticated water treatment technology and efficient vacuum trucks, sets new standards for sustainability in infrastructure maintenance. This approach not only ensures compliance with strict Australian environmental regulations but also offers significant cost savings and environmental benefits.

As Australia continues to prioritise worker health, environmental protection, and sustainable infrastructure development, the combination of hydro demolition and advanced water treatment is poised to play an increasingly vital role in dam maintenance and rehabilitation projects across the country.

Thank You

Chris Brooks
National Bid and Growth Manager