

Technology Safety Data Sheet

AIMM Technologies Inc., Hydrokinetics™ Cleaning Process

Section 1: Technology Identity

Technology Name(s):		Emergency Contact:	
AIMM Technologies Inc., Hydrokinetics™ Cleaning Process		Brooks G. Bradford, President Phone: 409-935-4508 Fax: 409-935-4738	
Manufacturer's Name and Address:		Information Contact:	
AIMM Technologies Inc. 405 Ross, La Marque, TX 77568 Phone: 409-935-4508 Fax: 409- 935-4738 E-mail: aimmtech@wt.net http://www.aimmtechnologies.com		Kim M. Massey, Manager Condenser Support Phone: 757-857-6400 Fax: 757-858-7491	
Date Prepared:	August, 2002	Date Revised:	Not yet revised.

Section 2: Technology Pictures



Figure 1: HPW Plunger Pump Assessed in September 2000.



Figure 2: HPW Plunger Pump Assessed in April 2002.



Figure 3: Hydrokinetics™ Console as Assessed in September 2000.



Figure 4: New Hydrokinetics™ Valve Box.



Figure 5: New Hydrokinetics™ Workstation.

Section 3: Technology Description

The Hydrokinetics™ cleaning process, for the clearing and cleaning of fouled interiors of tubes, pipes, and lines, relies on the induction of "Sonic Resonance" into the cleaning water stream. The Hydrokinetics™ cleaning process has two phases of operation, water phase, and bullet phase. The water phase consists of filling the pipe with water, and introduction of sonic resonance through the piping follows. The resonance transfers to both the pipe and the fouling material. The different densities of the two materials cause them to vibrate at different frequencies. The contrasting vibrations cause a break in cohesion between the fouling material and the pipe wall. Fouling material generally extrudes from the end of the tube in large snake-like pieces rather than particulate as in conventional hydro-blasting. When water flow is achieved, a bullet is introduced into the pipe to maintain the water column. In the bullet phase, the piping is refilled with water, the sonic resonance is again transferred through the water column; the fouling material and bullet are flushed out of the pipe by the water stream.

Section 4: Safety Hazards

Hazard Category:

(Adapted from Appendix A to MIL-STD-882D, February 10, 2000, Department of Defense Standard Practice for System Safety.)

- 4 - Could result in death or permanent total disability
- 3 - Could result in permanent partial disability or injuries or occupational illness that may result in hospitalization of at least three persons
- 2 - Could result in injury or occupational illness resulting in one or more lost work days
- 1 - Could result in injury or illness not resulting in a lost work day
- N/A - Is not applicable to this technology and poses no appreciable risk

A. Buried Utilities, Drums, and Tanks	Hazard Rating: N/A
--	---------------------------

This hazard is not applicable to this technology.

B. Chemical (Reactive, Corrosive, Pyrophoric, etc)	Hazard Rating: 1
---	-------------------------

There is minimal risk of chemical exposure, but is dependent on the contents of the blocked pipeline. Vapors, gases, liquids, and solids could all be found within the blocked piping. It is important that the contents of the blocked pipeline be known before any work begins.

C. Confined Space	Hazard Rating: N/A
--------------------------	---------------------------

This hazard is not applicable to this technology.

D. Electrical	Hazard Rating: 1
----------------------	-------------------------

Either a 12-volt DC or a 120-volt AC electrical source can power the Hydrokinetics™ workstation. All other processes and valves are mechanical or air actuated. A low voltage current is used to control the pneumatic valves. Equipment grounding is not required, but recommended.

E. Explosives	Hazard Rating: N/A
----------------------	---------------------------

This hazard is not applicable to this technology.

F. Fire Protection	Hazard Rating: 1
---------------------------	-------------------------

There is minimal risk from fire and explosion, but is dependent upon the contents of the blocked pipeline. Vapors, gases, liquids, and solids could be found within the blocked piping. It is important that the contents of the blocked pipeline be known before any work begins.

G. Gas Cylinders	Hazard Rating: N/A
-------------------------	---------------------------

This hazard is not applicable to this technology.

H. Ladders/Platforms	Hazard Rating: 1
Use three points of contact when descending and ascending ladders. Use a haul rope for movement of hoses to heights. When platforms are used, assure sufficient footing area free of tripping hazards. Assure proper tie-off points when working on an elevated working surface.	
I. Lockout/Tagout	Hazard Rating: 3
Water and air pressure are sources of potential energy with the Hydrokinetics™ technology. Use lockout/tagout procedures when servicing any of the system components. A keyed switch or key-code should control the high-pressure water (HPW) pump and Hydrokinetics™ workstation. All sources of potential energy must be controlled by a lock, key-code, or keyed switch.	
J. Mechanical Hazards	Hazard Rating: 3
Operating the Hydrokinetics™ cleaning process presents some mechanical hazards since there are some moving parts within the system. The HPW pump and air compressor are the sources of mechanical movement. All moving parts need to be guarded and lockout/tagout procedures must be followed during maintenance procedures. Screening is needed around the fan and spindle on the diesel engine.	
K. Moving Vehicles	Hazard Rating: 1
The high-pressure water pump is trailer mounted. Vehicle movement is possible on a large job site. Use proper mirrors and backup alarm on vehicle.	
L. Overhead Hazards	Hazard Rating: 1
When connecting to blocked piping at heights, use proper safety precautions for the work area. Use proper PPE, such as fall protection and hardhat. Use barricades to prevent persons from entering work area.	

M. Pressure Hazards	Hazard Rating: 3
<p>High-pressure water at 2,000 psi and greater at 20 gallons per minutes, requires caution. Water pressures at the orifice/manifold can be hazardous. The orifice size in use determines the effective pressure of the water stream, per unit of area. The Hydrokinetics™ cleaning process uses a half-inch orifice at the end of the high-pressure water hose. The use of the large orifice significantly reduces the potential energy, per unit area, of the water stream erupting from the high-pressure water hose. A large half-inch orifice allows water to flow rapidly but reduces its cutting ability while increasing its pushing ability. Body contact with a large water column such as this will act as a blunt instrument rather than a cutting instrument. Conversely, body contact with the water stream from a hole in a high-pressure water hose will result in instantaneous cutting; however, more damage to the human body will result from water traveling through veins and arteries. If water does travel through veins and arteries, the affected area may become infected and require amputation.</p> <p>Water hoses present a potential struck-by hazard upon rupture or disconnection. High-pressure water hoses need safety straps at all connection fittings to prevent whipping in the event of a hose disconnection. Proper hose selection, assembly, and inspection are required. Lockout/tagout of the high-pressure water is necessary before any intended contact with or proximity to the orifice/manifold.</p> <p>The greatest source of any hazard from high-pressure water using the Hydrokinetics™ system arises from the clogged piping system. Upon pressurization, the clogged piping system becomes the weakest link in the high-pressure water chain. All parts and hoses used by the Hydrokinetics™ cleaning process are certified to withstand rated pressures; however, the pressures the clogged piping system can withstand can only be estimated based upon original piping material specifications. Age, uses, and undetectable damage all can contribute to pipe failure at any time while pressurized. Protecting personnel from exposure to the pressurized clogged piping is of great concern. A pressurized pipe can rupture with explosive forces scattering debris over large areas and great distances.</p> <p>The Hydrokinetics™ technology operates at high air pressure (120 psi), which can pose risks to operators. Air hoses need to be inspected, tightened, and properly secured. Air hoses need safety straps at all connection fittings to prevent whipping in the event of a hose disconnection. Lockout/tagout of the air pressure is necessary before any intended contact with or proximity to the air hose connections. The unintentional release of a hose could result in an uncontrolled, whipping action that could cause severe injuries.</p> <p>As a part of the new Hydrokinetics™ operator's console, the water valves are electronically controlled and air actuated. The redesign of the operator's workstation eliminates the operator's proximity to the air and water hoses.</p>	
N. Slips/Trips/Falls	Hazard Rating: 1
<p>The Hydrokinetics™ cleaning process requires water and air hoses that can create tripping hazards. These hoses must be managed to keep the work area free from tripping hazards. Group hoses together and place to the side of high-traffic areas.</p>	
O. Suspended Loads	Hazard Rating: N/A
<p>This hazard is not applicable to this technology.</p>	
P. Trenching/Excavation	Hazard Rating: N/A
<p>This hazard is not applicable to this technology.</p>	

Section 5: Health Hazards

A. Inhalation

Hazard Rating: 2

Personnel exposure is greatly dependent upon the site of operation. Air monitoring may be warranted depending upon the likelihood of contaminants being present. Exhaust fumes from the diesel engine will be present. If the diesel engine is used inside, air monitoring for oxygen, carbon monoxide, and diesel particulate, should be performed.

B. Skin Absorption

Hazard Rating: 1

Contaminants in the work area such as lead or radionuclides can be easily contacted by personnel. Personnel should wash exposed body parts before eating or drinking. Specific PPE may be required to protect against radionuclides and other contaminants in the work area.

C. Noise

Hazard Rating: 2

Noise monitoring has shown values above the OSHA Permissible Exposure Limit for an eight-hour work shift when within 35 feet of the high-pressure water pump. If design or system changes are made more monitoring is warranted. A hearing conservation program should be in place due to the over exposures projected. Personnel in the areas of the air compressor and the HPW pump should wear hearing protection.

D. Heat Stress/Cold Stress

Hazard Rating: 1

Technology does not produce a hazard but ambient conditions need to be considered and monitored. PPE requirements for entering work zone will increase the risk of heat stress.

E. Ergonomics

Hazard Rating: 2

The redesigned Hydrokinetics™ workstation greatly reduces the stresses and strains on the body that personnel previously experienced. Connecting hoses to the blocked piping presents ergonomic risks because of the poor postures involved. Pulling on hoses will stress the lower back, making proper lifting techniques important. Proper lifting techniques need to be a part of personnel training.

F. Ionizing Radiation

Hazard Rating: N/A

This hazard is not applicable to this technology.

G. Non-ionizing Radiation

Hazard Rating: N/A

This hazard is not applicable to this technology.

H. Biological Hazards

Hazard Rating: N/A

This hazard is not applicable to this technology.

I. Other	Hazard Rating: 1
<p>Before work can begin, a site-specific evaluation must be completed due to environmental conditions. Contaminants within the blocked piping must also be known so that proper PPE can be used. The area around the piping undergoing unblocking needs barricading and labeling to prevent personal injury should a pipe failure occur.</p>	
<p>Section 6: Phase Analysis</p>	
<p>A. Construction/Start-up</p>	
<p>The set-up phase requires connection of hoses to the blocked piping and valve box. The workstation easily connects to the valve box via a computer cable. All hoses need to be inspected before installation. Muscular/back injury is possible while moving water and air hoses. Manage water and air hoses to prevent slips/trips/falls. The high-pressure water system presents pressure hazards. Hoses and the corresponding fittings need labels to assure proper connection. This phase also presents pinch points and struck by/caught between hazards. A vehicle is required to position the water pump trailer. Given that most of the work will be done on unfamiliar sites, there are risks associated with moving vehicles.</p>	
<p>B. Operation</p>	
<p>The operational phase presents several hazards including:</p> <ul style="list-style-type: none"> ▪ Lockout/tagout, ▪ Potential exposure to contaminants dependent upon location and blocked piping, ▪ Noise hazards dependent upon location, and ▪ Risks from excessive pressure. <p>The area near the blocked piping system and the Hydrokinetics™ operation needs barricades and labels. Assure operator training on the Hydrokinetics™ cleaning process, PPE. Assure adequate workspace free of tripping hazards.</p>	
<p>C. Maintenance (Emergency and Routine)</p>	
<p>Routine maintenance may require respiratory protection, depending on the toxicity of the contaminant and the part of the system that is being worked on. Any maintenance work is particularly hazardous if contaminants are within the system. Lockout/tagout programs must be carefully followed to avoid a serious injury. Use lockout/tagout procedures when maintenance is performed on any system component.</p>	
<p>D. Shutdown (Emergency and Routine)</p>	
<p>The Hydrokinetics™ technology does not incorporate any emergency stops. The high-pressure water and air systems need devices to control, lockout, and release the system pressures in the event of an emergency. The Hydrokinetics™ technology does not create any additional need for shutdown procedures once all sources of potential energy have been controlled.</p>	

E. Decontamination/Decommissioning

Decontamination of the Hydrokinetics™ technology would require sampling to determine the extent to which contamination has spread throughout the water supply. The use of a one-way valve would help reduce the likelihood of system component contamination.

Section 7: Worker Protection Measures

A. Exposure Monitoring

Air monitoring of personnel exposures to toxic substances is warranted if contaminants are within the blocked piping system. The possibility of vapor, gas, liquid, and solid contaminants exists. Air monitoring is particularly critical when the blocked piping is contaminated with radioactive materials or highly toxic agents. Personnel need periodic monitoring for noise exposure. Assure proper hearing protection is in use as needed.

B. Worker Training

Personnel require training on high-pressure water operation techniques. Operators require specific training on the Hydrokinetics™ technology operation. Additionally, training on proper PPE usage dependent upon site conditions is recommended. Training on the Hydrokinetics™ cleaning process should include: lockout/tagout, hazard communication, hearing conservation, and hazard assessment.

C. Medical Surveillance

A good general health screening with emphasis on the back and cardiovascular/respiratory system is warranted. Depending on the contaminant present in the blocked piping system, airborne levels, and the need for respiratory protection/PPE, medical surveillance may be required by OSHA standards. A hearing conservation program needs to be in place. In addition, annual audiograms may be warranted depending upon typical daily working conditions.

D. Engineering Controls

- The high-pressure water pump assessed had no noise dampening controls, however site personnel claim the company has other pumps that have extensive noise control modifications. No information was provided to support this claim nor was any noise comparison data given. Any reduction in the sound pressure levels emanating from the pump would greatly improve working conditions for the operators.
- No emergency stop device exists for the Hydrokinetics™ technology. The redesign of the workstation to use electronically controlled air actuated valves now enables the incorporation of an emergency stop. The installation of an emergency stop on the operator's workstation is required and an interlock system with multiple stop devices is suggested. The stop device must be able to stop the flow of air and water and eliminate the pressures within the hoses.
- Decontamination of the Hydrokinetics™ technology would require sampling to determine the extent to which contamination has spread throughout the water supply. The use of a one-way valve would help reduce the likelihood of system component contamination.

E. Administrative Controls

Due to high noise levels when in close proximity to the pump, hearing protection is required. Placement of the pump and operators workstation is of importance. Separating the two by a distance greater than forty feet, when used in an open location, will likely not require the operator at the workstation to wear hearing protection. Noise sampling needs to be conducted at each worksite to confirm this, and the distance may vary depending upon site conditions.

F. Personal Protective Equipment

PPE required for operation of the Hydrokinetics™ technology consists of earplugs and earmuffs depending upon noise levels, face shield, steel toe boots, hardhat, leather gloves, rain suit, and respirator depending upon presence of airborne contaminants.

Section 8: Emergency Preparedness

Emergency response planning for a site needs to assure adequate coverage for hazards described in the TSDS. Having at least one worker per shift trained in CPR and first aid is recommended. The crew should discuss the worst-case scenarios at each site and plans should be made on how to deal with each scenario before work begins. If contaminants are within the piping, actions need to be taken to protect all personnel. The Hydrokinetics™ technology does not create any additional need for emergency preparedness.

Section 9: Comments, Lessons Learned, & Special Considerations

The Hydrokinetics™ cleaning process technology is more protective of workers than standard pipe unblocking. Only personnel who have been adequately trained should attempt to operate the technology. Knowledge of the blocked piping is important to the safety and health of all personnel.

This Technology Safety Data Sheet Was Prepared By:

Team Leader:

Aaron A. Ondo

Operating Engineers National Hazmat Program
3775 Morgantown Industrial Park Bldg. 400
Morgantown, WV 26501
304-284-9129 FAX: 304-284-9130

Team Member:

Mark Schaunaman, Apprenticeship Director
South Florida Operating Engineers
Apprentice & Training Trust, Local 487
1425 NW 36th St., Miami, FL 33142

Copies of this Technology Safety Data Sheet and others developed by the Operating Engineers National Hazmat Program can be found on the internet at: www.iuoeiettc.org.