SECTION 6 - TECHNOLOGY SAFETY DATA SHEET

TECHNOLOGY SAFETY DATA SHEET
AEA Technology Engineering Services
Fluidic Pipe Unblocking System

<table>
<tr><th colspan="2">SECTION 1: TECHNOLOGY IDENTITY</th></tr>
<tr><td rowspan="3">Manufacturer's Name and Address:

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None</td><td>Signature of Preparer:

Operating Engineers National Hazmat Program
1293 Airport Road, Beaver, WV 25813
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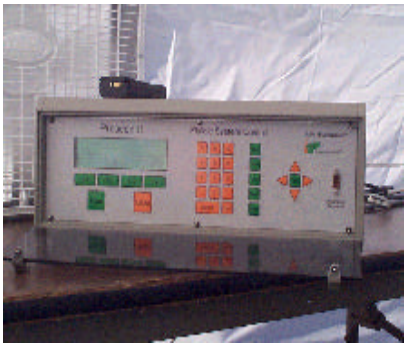
Under cooperative agreement DE-FC21-95MC32260</td></tr>
</table>

SECTION 2: PROCESS DESCRIPTION

The AEAT Fluidic System has two phases of operation, suction phase and drive phase. By alternating these phases the blockage can be removed. The alternation of the two phases creates a lapping effect at the blockage site (this process is analogous to waves eroding the sand from a beach). The frequency and amplitude of the waves can be varied so that the eroded material is transported away from the blockage to aid in the erosion process. This continues until there is a clear path through the blockage.

The two phases are accomplished using air pressure. Initially air is removed from the pipe creating a vacuum. Water is then drawn into the pipe due to the negative pressure within the pipe. Using air pressure, the jet pump pair and fluidic pump move the water within the pipe to create a wave action at the site of the pipe blockage.

SECTION 3: TECHNOLOGY PHOTOS



System control.

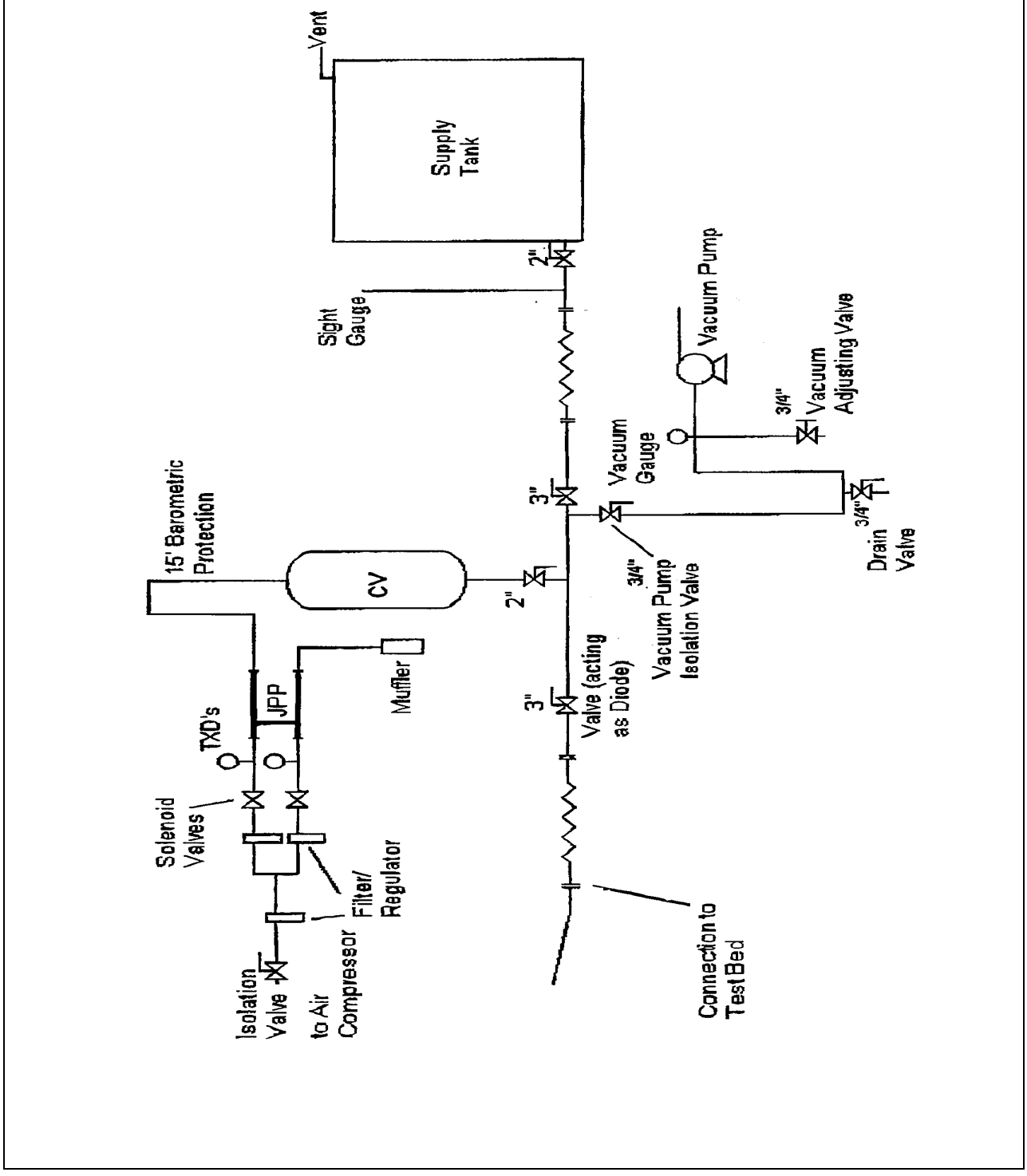
Valve manifold.

Jet pump pair.

Supply tank and muffler.

AEAT Fluidic Pipe unblocking system.

SECTION 3: SYSTEM DIAGRAM



SECTION 4: CONTAMINANTS AND MEDIA
The AEAT Fluidic System does not produce any contaminants. However, because the blocked piping may contain contaminants, inline filters should be installed to reduce the likelihood of system contamination. The entire system as observed could become contaminated upon the initial vacuum creation. The possible contaminants will need to be identified as part of a site characterization prior to the beginning of the job. A monitoring plan will need to be considered on a site-by-site and job-by-job basis.

SECTION 5: ASSOCIATED SAFETY HAZARDS	
Probability of Occurrence of Hazard: 1 Hazard may be present but not expected over background level 2 Some level of hazard above background level known to be present 3 High hazard potential 4 Potential for imminent danger to life and health	
A. ELECTRICAL (LOCKOUT/TAGOUT)	RISK RATING: 4
The AEAT Fluidic System as observed had no lockout/tagout abilities. The installation of a keyed electronic switch or other such locking devise is necessary. The use of GFCI circuits and proper grounding of all system components is also necessary.	
B. FIRE AND EXPLOSION	RISK RATING: 1-4
There is risk from fire and explosion depending upon the contents of the blocked pipeline. Vapors, gases, liquids, and solids could all be found within the blocked piping. It is paramount that the contents of the blocked pipeline be known before any work begins. AEAT Fluidic System as observed is not intrinsically safe and could not be used in a potentially explosive atmosphere.	
C. CONFINED SPACE ENTRY	RISK RATING: 4
Working with AEAT Fluidic System in any work area that meets the definition of a confined space provides the potential for serious harm. All such projects must be planned carefully and compliance with OSHA standards is essential to protect workers. The water supply tank used was itself a confined space and needs to be labeled as such.	
D. MECHANICAL HAZARDS	RISK RATING: 1
Operating AEAT Fluidic System presents little mechanical hazards since there are very few moving parts within the system.	

SECTION 5: ASSOCIATED SAFETY HAZARDS (CONTINUED)	
E. PRESSURE HAZARDS	RISK RATING: 4
The air line and vacuum/pressure hoses present a potential struck by hazard if they were to rupture or disconnect. Frequent inspection is advised. Proper air line and hose selection for the positive and negative pressures involved is required.	
F. TRIPPING AND FALLING	RISK RATING: 3
The large vacuum/pressure hose should be located as not to impede personnel. All air line and electrical wires need to be positioned to avoid creating tripping hazards.	
G. LADDERS AND PLATFORMS	RISK RATING: 2
AEAT Fluidic System did not require ladders or scaffolds as observed, although they may be needed for connection to the blocked piping.	
H. MOVING VEHICLES	RISK RATING: 3
The presence of multiple pieces of equipment (which may be needed to unload and load technology) in relationship to a small area of operation may pose a significant danger. Sufficient warning devices such as horns, bells, lights, and back-up alarms should be used. Several of the pieces of AEAT Fluidic System require a forklift to safely handle the load. OSHA's industrial lift truck standard must be complied with to avoid incidents during the loading and unloading of AEAT System.	
I. BURIED UTILITIES, DRUMS, AND TANKS	RISK RATING: 3
The water supply tank is a confined space and needs to be labeled. The charge vessel used was the American Society of Mechanical Engineers (ASME) "U" stamped and certified as a pressure vessel. Proper inspection is required.	
J. PROTRUDING OBJECTS	RISK RATING: 2
The handles on the valves were obtrusive. Redesigning the location of the valves is suggested. The hoses protruding from the valves create more of an obstacle for personnel to move around.	
K. GAS CYLINDERS	RISK RATING: N/A
Not part of this technology.	
L. TRENCHING AND EXCAVATIONS	RISK RATING: N/A
Not part of this technology.	
M. OVERHEAD LIFTS	RISK RATING: N/A
Not part of this technology.	
N. OVERHEAD HAZARDS	RISK RATING: 1
The top of the charge vessel is above head height, but does not present an overhead hazard.	

SECTION 6: ASSOCIATED HEALTH HAZARDS	
Probability of Occurrence of Hazard: 1 Hazard may be present but not expected over background level 2 Some level of hazard above background level known to be present 3 High hazard potential 4 Potential for imminent danger to life and health	
A. INHALATION HAZARD	RISK RATING: 1-4
Personnel exposure is greatly dependent upon the site of operation. Air monitoring may be warranted depending upon the contaminants present.	
B. SKIN ABSORPTION	RISK RATING: 1-4
Personnel exposure is greatly dependent upon the site of operation.	
C. HEAT STRESS	RISK RATING: 1
Technology does not produce a hazard, but ambient conditions need to be considered.	
D. NOISE	RISK RATING: 1
Noise monitoring has shown values below the OSHA PEL for an 8-hour work shift. If design or system changes are made more monitoring is warranted. A Hearing Conservation Program should be in place due to the possible locations of operation.	
E. NON-IONIZING RADIATION	RISK RATING: N/A
Not part of this technology.	
F. IONIZING RADIATION	RISK RATING: N/A
Not part of this technology.	
G. COLD STRESS	RISK RATING: 1
Technology does not produce a hazard, but ambient conditions need to be considered.	
H. ERGONOMIC HAZARDS	RISK RATING: 2
The operation of AEAT Fluidic System greatly reduces the stresses and strains on the body that are a normal part of pipe unblocking. Turning the valves and the connection of the piping assembly presents increased risk of back problems, because of the poor postures involved with the lift and the bulkiness of the items. Proper lifting techniques need to be a part of personnel training.	
I. OTHER	RISK RATING: 1-4
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.	

SECTION 7: PHASE ANALYSIS

A. CONSTRUCTION/START-UP

Training on the AEAT Fluidic System should include: lockout/tagout, Hazard Communication, noise conservation, and hazard assessment. The setup phase requires the unloading of several large objects using a forklift. Given that most of this will be done on unfamiliar sites, there are significant risks associated with vehicles moving on uneven ground with large loads. Setting up the system also involves establishing electrical connections and connecting hoses for the vacuum/pressure cycle. This phase presents several hazards including struck by/caught between hazards, pinch points, slips/trips/falls, muscular/back injury, and electrical hazards.

B. OPERATION

The operational phase presents several hazards including:

- Lockout/tagout.
- Potential exposure to contaminants dependent upon location and blocked piping.
- Noise hazards dependent upon location.
- Risks from excessive pressure.
- Electrical shock.

C. MAINTENANCE

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.

D. DECOMMISSIONING

The decommissioning phase presents several hazards including exposure to the contaminants, pinch points, slips/trips/falls, and muscular/back injury.

SECTION 8: HEALTH AND SAFETY PLAN REQUIRED ELEMENTS

(If this technology is used on hazardous waste sites, the following information should be included in the written Health and Safety Plan that is required by OSHA under 29 CFR 1910.120.)

A. AIR 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.

SECTION 8: HEALTH AND SAFETY PLAN REQUIRED ELEMENTS (CONTINUED)

(If this technology is used on hazardous waste sites, the following information should be included in the written Health and Safety Plan that is required by OSHA under 29 CFR 1910.120.)

B. WORKER TRAINING

Worker training is an important element in preventing injuries. Training in the operation of AEAT Fluidic System is important. Special emphasis should be placed on training workers to operate the controls of the system controller. Other safety and health training that may prove helpful for the workers include:

- HAZWOPER
- HAZCOM
- RADWORKER I
- RADWORKER II
- Respiratory Protection
- Hearing Conservation
- Personal Protective Equipment
- Electrical Safety
- Lockout/Tagout
- Ergonomics (proper lifting, bending, stooping, kneeling, and static postures, etc.)
- Heat stress (learning to recognize signs and symptoms)
- Cold stress (learning to recognize signs and symptoms)
- CPR/First Aid/Emergency Response/Bloodborne Pathogens
- Hand Signal Communication
- Construction Safety (OSHA 500) and or General Industry Safety (OSHA 501)
- Forklift

C. EMERGENCY RESPONSE

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.

D. MEDICAL SURVEILLANCE

A good general screening of the crew's health with emphasis on the back and cardiovascular/respiratory system is usually warranted. Depending on the contaminant present and the airborne levels, medical surveillance may be required by OSHA standards.

E. INFORMATIONAL PROGRAM

Workers must be trained in specific operation of equipment before use.

SECTION 9: COMMENTS AND SPECIAL CONSIDERATIONS
The AEAT Fluidic System 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 paramount to the safety and health of all personnel.