Technology Safety Data Sheet
Dual Coriolis Monitoring System
TMS # 2989

Section 1: Technology Identity

Technology Name(s):	Emergency Contact:
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Section 2: Technology Pictures

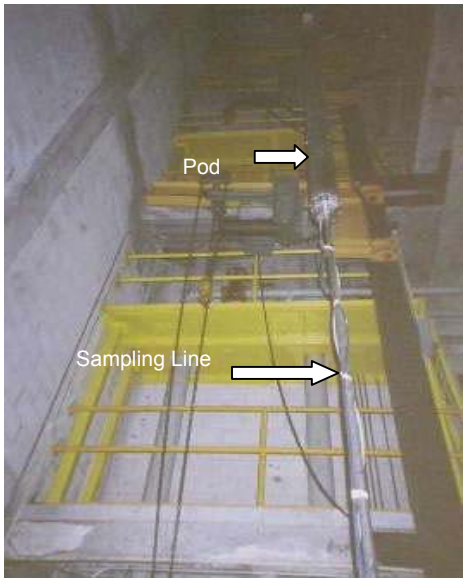

Figure 1: The 25 ft. long, Dual Coriolis sampling probe suspended in an elevator shaft at FIU showing pod and sampling line.

Figure 2: Operator Monitoring Data from probe during testing.

Section 3: Technology Description

The Dual Coriolis Slurry Monitoring System (DCMS) is designed to provide real-time measurement of high-level waste slurry characteristics prior to transfer of wastes. This technology measures the percent of suspended solids in the slurry. The operating principle of this technology is similar to the method used in laboratories: determine the density of the slurry, determine the density of the slurry filtrate, and knowing the density of the solids, calculate the weight percent undissolved (suspended) solids. This technology uses Coriolis meters to measure the densities of the slurry and slurry filtrate. The DCMS can supply real time measurement at several elevations to characterize the slurry and eliminate exposure of personnel to high levels of radioactivity.

The DCMS is contained inside a 6-inch, outside diameter, schedule 40, and stainless steel pipe. This "pod" section is approximately 13-feet long. Attached to the bottom of the pod is a 1-inch diameter schedule 40 pipe, approximately 12-feet long. This sampling pipe is used to transfer the slurry from the tank to the pod. A Moyno progressive cavity pump is mounted at the bottom of the pod, with the suction connected to the sampling line. The discharge from the pump flows into the first Coriolis meter, which determines the density of the slurry. The slurry then flows through a cross-flow filter and back into the tank. The filtrate from the cross-flow filter then flows into the second meter, which determines the density of the filtrate. Then the filtrate flows back into the tank. The power cables for the system and the cables carrying the electronic information from the meters exit the top of the pod. The electronic cables are connected to local indicating transmitters that can display the physical properties of the slurry being analyzed. The transmitted signals go to a computer that calculates the weight-percent solids and can display all the slurry's physical properties.

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:**	**1**

High-level waste (HLW) tanks are covered by 12 feet of earth.

B.	**Chemical (Reactive, Corrosive, Pyrophoric, etc)**	**Hazard Rating:**	**2**

Wastes have a pH of 10 and are corrosive in addition to their radiological hazard. Personal protective equipment (PPE) should be used to prevent contact with corrosives.

C. Confined Space	Hazard Rating: N/A
Confined space is not associated with this technology.	

D. Electrical	Hazard Rating: 2
• Electrical cables from the top of the pod to an electrical power supply and the Coriolis Meter indicating transmitters may present shock hazard. • Electrical cables from the Coriolis meter-indicating transmitter to the power supply and to the computer may present shock hazard. • Power cable to the chain hoist may present shock hazard. • Follow procedures for connecting, maintenance, and dismantlement of components.	

E. Explosives	Hazard Rating: N/A
Explosives are not part of this technology.	

F. Fire Protection	Hazard Rating: 2
The radioactive waste within the tanks, into which this technology will be deployed, generates hydrogen gas, which is very flammable and would be explosive in a contained system such as a tank. There is ventilation provided for the tanks to control the hydrogen concentration below the lower explosion limit (LEL). A check should be made to ensure that the tank ventilation system is adequately operational before opening the riser to avoid personnel exposure. If hydrogen monitoring systems are installed, that the limits of hydrogen concentration are within acceptable limits.	

G. Gas Cylinders	Hazard Rating: N/A
No compressed gas cylinders are used with this technology.	

H. Ladders/Platforms	Hazard Rating: 2
Probe assembly would involve the use of a platform or platform lift. Use approved lifts and do not work under the load.	

I. Lockout/Tagout	Hazard Rating: 2
Lockout and tagging is required for electrical and pressurized energy sources during installation, maintenance, and decommissioning of the unit.	

J. Mechanical Hazards	Hazard Rating: 2
• Personnel may be exposed to heavy equipment during setup, assembly, unit insertion, and removal from the tank riser pipe. Wear hard hats, safety glasses, and safety shoes. • Pinch point when locking pin is inserted. Follow procedures and wear gloves.	

K. Moving Vehicles	Hazard Rating: 2
Forklift and crane operation during unloading, assembly, and dismantlement can create struck-by hazards to workers. Operators need to be aware of location of all workers.	

L. Overhead Hazards	Hazard Rating: 2
Hoist mounted overhead gantry operation. Wear hard hats and exercise caution when working near gantry.	

M. Pressure Hazards	Hazard Rating: 1
Pressurized back flush system, follow procedures for operation.	

N. Slips/Trips/Falls	Hazard Rating: 2

- Electrical cables from the top of the pod to an electrical power supply and the Coriolis Meter indicating transmitters can be tripping hazards if not properly secured.
- Electric cables from the Coriolis meter indicating transmitters to a power supply and to the computer can be tripping hazards if not properly secured.
- Hoses from the pressurized back flushing unit to the pod can be a tripping hazard if not properly secured.
- Group, secure, and cover cables.
- Secure hose and tubing.

O. Suspended Loads	Hazard Rating: 3

- Crane will be used to assemble, insert, and extract unit from the riser pipe. Do not work under the load.
- Overhead gantry and hoist will be used to lower and raise unit during operation. Wear hardhat and exercise caution when working in area.

P. Trenching/Excavation	Hazard Rating: N/A
No trenching or excavations are required for this unit.	

Section 5: Health Hazards

A. Inhalation	Hazard Rating: 1
Exhaust fumes from the forklift or crane operation may be present and should be evaluated as part of the planning process.	

B. Skin Absorption	Hazard Rating: 2
Wastes have a pH of 10 and are corrosive in addition to their radiological hazard. Use proper PPE.	

C. Noise	Hazard Rating: 1
This system does not produce noise; however, during assembly and insertion machinery and tools used may present a hazard and should be evaluated as part of the planning process.	
D. Heat Stress/Cold Stress	**Hazard Rating: 2**
• Personnel in protective clothing could be subject to heat stress. • The Dual Coriolis system does not produce cold surfaces.	
E. Ergonomics	**Hazard Rating: 2**
Manual positioning of individual components, insertion of the locking pin and lifting when the system is removed, may create bending and lifting hazards. Transport all components mechanically close to assembly point, seek help in lifting heavy loads, and use proper work positions.	
F. Ionizing Radiation	**Hazard Rating: 2**
• Ionizing Radiation is not a part of the Dual Coriolis monitoring system but the unit is designed to collect measurements from HLW. • The pod and sampling line will become contaminated by the contents of the tank. Decontamination during removal from the riser pipe is necessary. • Exposure to radiation may occur when the riser pipe is opened and during maintenance. Follow approved procedures and use an appropriate level of PPE.	
G. Non-ionizing Radiation	**Hazard Rating: N/A**
Non-ionizing radiation is not used or generated by this technology.	
H. Biological Hazards	**Hazard Rating: N/A**
No biological hazards are part of this technology.	
I. Other	**Hazard Rating: N/A**
None	

Section 6: Phase Analysis

A. Construction/Start-up

- Unloading of the unit may expose workers to ergonomic risks. Use care when working on the edge of the truck and maintain three points of contact when climbing onto and out of the truck bed, in/out of the crane or forklift.
- Assembly of the sampling line to the pod will expose workers to overhead hazards when using the crane. Use a platform or platform lift to connect the line to the pod, do not work under the load, and ensure that the unit is stabilized during assembly.
- Electrical cords, the power line, and the hose used to deliver power to the unit can create tripping hazards. Cables should be grouped, secured, and covered. Hose and tubing should be secured.
- This phase involves insertion of the unit into the riser pipe. Once opened, the worker may be exposed to radiological materials and protective clothing necessary for the level of radiological contamination should be used.

B. Operation

- Insertion and removal of the locking pin presents the worker with pinch point and ergonomic hazards. Gloves should be worn and proper ergonomic positions used.
- Working near the riser pipe involves potential exposure to radiation and protective clothing necessary for the level of radiological contamination should be used.

C. Maintenance (Emergency and Routine)

- Routine work on the unit involves potential exposure to radiation. Protective clothing necessary for the level of radiological contamination should be used.
- Routine insertion and removal of the locking pin presents the worker with pinch point and ergonomic hazards. Gloves should be worn and proper work position used.

D. Shutdown (Emergency and Routine)

- Disassembly of the sampling line to the pod will expose workers to overhead hazards when using the crane. Follow approved procedures and do not work under load.
- Electric cords and the power line, used to deliver power to the unit can create tripping hazards. Cables should be grouped and secured.

E. Decontamination/Decommissioning

- Loading of the unit may expose workers to ergonomic risks when preparing and loading the unit onto the truck. Use care when working on the edge of the truck and maintain three points of contact when climbing onto and out of the truck bed.
- Decontamination will be necessary for all parts exposed to waste. The worker may be exposed to radioactive and chemical hazards. Protective clothing may be necessary because of residual contamination.

Section 7: Worker Protection Measures

A. Exposure Monitoring

- Personal and area monitoring is warranted for radiation and hydrogen gas when the riser pipe to the waste tank is opened.
- The Department of Energy generally requires that workers in radiation areas wear radiation dosimeters.
- The unit does not generate noise levels over the OSHA standard and hearing protection is not needed.

B. Worker Training

The following subjects should be covered in a training program for workers:

- Operating procedures for assembly of the unit;
- Operating procedures for insertion of the unit into the riser pipe;
- Procedures for connection of the unit to the chain hoist and support system;
- Procedures for operation of the unit including startup, normal operation, shutdown, emergency shutdown, and preparation for maintenance;
- Procedure for removal of the unit from the tank;
- Decontamination procedures in preparation for disposal of the system and its parts;
- Hoisting and lifting
- Heat/cold stress
- Personal Protective Equipment;
- Site specific and OSHA compliant lockout/tagout for personnel working on electrical data logging or power distribution for the system;
- Site specific emergency response plan; and
- Department of Energy requires varying levels of radiological training prior to working in radiological areas depending upon the area entered, radiation and contamination present, and the type of work being performed. Training requirements are specified in the Radiological Control Standard and include: Orientation Training, General employee Radiological Training, Radiological Worker I Training, and Radiological Worker II Training.

C. Medical Surveillance

There are no requirements for medical surveillance associated with the Dual Coriolis Monitoring System; however, the task performed with the system will expose the unit to radiological hazards, which will require various types of medical surveillance.

D. Engineering Controls

Certified hoisting, mechanical lifting and transport equipment for assembly, installation and maintenance of the unit should be used.

E. Administrative Controls

- Procedures for assembly, installation, operation, and maintenance of the unit
- Procedures for all critical operations
- Worker radiation and hazardous materials programs

F. Personal Protective Equipment

- Safety shoes, safety glasses, and hard hats should be used during assembly, insertion, and removal of the unit.
- Safety glasses, radiation, and chemical exposure protective clothing should be used during insertion of the unit, and during maintenance and decontamination/decommissioning of the unit.

Section 8: Emergency Preparedness

Emergency response procedures should identify how hazards noted in this TSDS (physical injury, exposures) will be addressed in the area. Each worker would be trained and understand how to respond to each potential emergency.

Section 9: Comments, Lessons Learned, & Special Considerations

Provide checklists, with verification means, for all critical operating steps.

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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.