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STORED WASTE AUTONOMOUS INSPECTOR ROBOT TRIAL WORK PLAN

05/13/94

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LETTER

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Department of Energy
Fernald Environmental Management Project
P.O. Box 398705
Cincinnati, Ohio 45239-8705

MAY 13 1994
DOE-1533-94

Mr. Paul D. Pardi, Group Leader
Division of Hazardous Waste Management
Ohio Environmental Protection Agency
40 South Main Street
Dayton, Ohio 45402-2088

Dear Mr. Pardi:

STORED WASTE AUTONOMOUS INSPECTOR ROBOT TRIAL WORK PLAN

Thank you for your comments on the Stored Waste Autonomous Inspector (SWAMI) Robot Trial Work Plan. Your comments are addressed in the enclosure. We feel it would be beneficial to discuss the project in face-to-face meetings either in Dayton or Fernald.

The goal of the proposed discussions is agreement on a set of criteria, sufficient to qualify robotically generated drum inspection findings as acceptable to the Ohio Environmental Protection Agency (OEPA) for Resource Conservation and Recovery Act (RCRA) reporting and inspection purposes. In addition, we wish to negotiate a set of mutually acceptable tests that are seen as demonstrating compliance with the criteria. It should be emphasized that the scope of the proposed automation is not to perform the entire RCRA mandated inspection, but rather the most time-consuming and hazardous component: inspection of the drums themselves.

SWAMI is intended primarily to be a device for leak prevention. It will spot imminent leaks before they break through the side of a drum. In addition to RCRA inspection, SWAMI provides other features, such as inventory verification, improvement of documentation, and hotspot monitoring.

If you have any questions, please contact Rod Warner of my staff at 513-648-3156. Also please inform him as to a date for a meeting.

Sincerely,

Johnny Reising

for Jack R. Craig
Fernald Remedial Action
Project Manager

FN:Shroff

Recycled and Recyclable

cc:

J. Saric, USEPA-V
G. Mitchell, OEPA-Dayton
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AR Coordinator, FERMCO

ENCLOSURE

1. *DOE must be careful when assessing SWAMI's abilities by comparing SWAMI results with those of current inspections, unless the accuracy of current inspections are assessed as well, SWAMI might meet your criteria of detecting 100% of the Category A drums found by current inspectors, but if the current inspector only identified 50% of the actual Category A drums, SWAMI's performance (and that of the inspector) is inadequate.*

   We understand your concern and hope to discuss this point with you further in person. Up to now, our approach for qualification of the robot inspections has focussed on demonstrating equal or better performance as compared to the manual inspections. We believe that the robot will be much more consistent and diligent, especially when inspecting hard-to-see areas on the highest and lowest drum stacks.

   We have avoided direct judgements on worker performance because it is the de facto standard and has been judged as being compliant with regulations. Additionally, since inspectors are part of the represented work force, direct performance evaluation could be seen as confrontational and contrary to the purpose of making them comfortable about the installation of new technologies like SWAMI.

2. *Proposed tests describe SWAMI's ability in detecting Category A, B, and C drums. There appears to be no tests planned to demonstrate SWAMI's accuracy in detecting Type I, II and III leakers. This seems to be the more critical of the two criteria since these involve drums that have leaked or will leak their contents.*

   Our original work plan did not fully describe our internal classification system for suspected leakers (A-C) and bona fide leakers (I-III). In order of increasing severity, a shining new drum would pass through categories A, B, and C. Once it is category C, it progressively becomes a type III, II, and then I leaker. Thus, SWAMI may well have found the drum defect before it leads to a leak, especially since many leaks occur on the side seam that is always placed so that it is visible. SWAMI will be part of a leak prevention program and will not be depended upon to identify leaks. That responsibility will remain with the manual inspector of the aisles, as part of the facility inspection.

3. *It is unclear how SWAMI will detect the following situations:*

   a. *Corrosion/dents on the bottom and/or top of the drums.*
   b. *Leakage from the "back" of the drums.*

   The top, bottom and "back" of drums are hidden from the view of humans and SWAMI. Neither human nor robot are able to view 100% of the drum's surface. However,drum corrosion usually starts along the side seam, which is always placed in clear view, or along the bottom ridge. In any event, this operating procedure, and the packing arrangement that occludes some drum surfaces, is part of the present, accepted baseline

methodology. Leaks originating on the unobservable drum surfaces will lead to a situation that will be identified by the continuing, manual aisle and facility inspections.

4. *It appears that SWAMI would rely mainly on the radiation detection to detect leaked material in those situations where the leak itself is undetectable to the vision system (i.e., bottom of drum). If this is the case, it must be ensured that SWAMI's detector is sensitive enough to detect leaked waste from all sources. In other words, DOE must be sure that all hazardous waste in storage is a mixed waste that emits radiation at levels that will trigger SWAMI's rad detector.*

   The radiation detector on SWAMI is intended as a backup method to supplement the human's continued inspection of the aisles, as part of the complete facility inspection (roof, fire sprinklers, safety equipment, etc.). Leaks are unlikely when the prevention program (i.e. SWAMI) is functioning properly. The sensors are not really intended to be a device for leak detection. It would be cost-prohibitive to outfit the robot with a suite of sensors that can detect all possible RCRA materials at minimum detectable levels. In any event, all facility inspections, including the aisles, will continue to be done by the presently accepted, manual approach.

5. *The safety features described for SWAMI do not include whether the root is intrinsically safe. This must be a consideration if SWAMI will be used to inspect drums of ignitable waste.*

   In the particular case of our field trials, the materials in the warehouses used for our demonstration, TS-5 and Building #79, do not present an explosion hazard. For the general case, however, this is a good point. We are presently checking to determine whether SWAMI is intrinsically safe. For the more general case of robot use in all RCRA areas, they will either be excluded from warehouses with certain ignition hazard levels, or they will require additional qualification as intrinsically safe.