

**USETI RAS Silmet Program:
Hazardous Waste Management , Pollution Prevention**

April & July 1996

TECHNICAL REPORT*

Donald H. McAlister, Jr.
Project Manager
United States Environmental Training Institute

Vacys J. Saulys
Work Assignment Manager
United States Environmental Protection Agency
Region 5

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I. Scope

The scope of this report will include the following.

1. In general terms, the USETI scoping mission conducted in April 1996 relative to management of radioactive and mixed wastes at RAS Silmet;
2. The USETI mission, conducted late June through early July 1996, to deliver workshop presentations to ministry representatives from Estonian governmental offices responsible for safeguarding the country's environmental resources and to members of RAS Silmet's technical staff; and
3. Future tasks undertaken at RAS Silmet to assure the protection of the workforce's safety and health, and protection of environmental resources.

II. Objectives

The technical objectives of the July USETI mission were to:

1. provide a review of the observations made by the USETI technical team that visited RAS Silmet in April 1996;
2. provide workshop presentations to Estonian ministry representatives and RAS Silmet technical staff members on the topics of waste management planning, waste minimization and pollution prevention, and occupational safety and health management; and
3. provide recommendations for future activities that would improve the quality and effectiveness of waste management and occupational safety and health management performance at Silmet.

III. Discussion

RAS Silmet is in a unique situation with respect to several different facets of its operation. It is likely the first weapons-complex facility of its type to undergo privatization in the post-cold war era. It faces unique challenges in establishing collaborative relationships with the government of Estonia, given the geopolitical history of the region. Silmet is also likely one of the first manufacturers in Estonia to produce a product for export to be utilized in high-technology component

manufacturing. Each one of these unique situations or challenges, in some way, currently influences or will influence environmental, and occupational safety and health management at Silmet. As noted by Mr. Saksing during his meeting with the USETI team the morning of July 1, 1996, Silmet is in a unique situation. Indeed, Silmet and Estonia have the opportunity to use their relationship as a benchmark of how an effective and collaborative relationship can be forged, which is mutually supportive to the regulatory mission of the Estonian government and the operational mission of Silmet.

USETI's team, which visited in April 1996, benefited from the opportunity to spend the greater portion of two days on escorted site tours through various Silmet facilities. The technical team members present in April were Mr. Chris McKeeman of the EnSafe Corporation, and Mr. Dan Hurst of the EET Corporation. Technical representation was also provided by Mr. Vacys Saulys of the USEPA Region V.

Following the April visit, the USETI technical team members highlighted key issues that, in their opinion, warranted priority attention due to the potential to cause harm to environmental resources, the public at large, or to plant personnel. However, it should be noted that identification of these issues in this report is not intended to suggest that RAS Silmet has not already directed attention to these issues. In July the USETI team learned from both Estonian government and Silmet representatives that actions have been taken and studies have been performed on a number of issues. But the outcome of these actions and findings of completed studies have not been shared with either the April or July USETI teams that visited Tallinn or Silmet. Consequently, there is redundancy in USETI's findings and the findings of studies performed at Silmet by other investigators.

1. The USETI technical team identified the Mazut fuel oil spill as a condition warranting prompt attention. The oil spill represents a potential groundwater and potable water supply contamination threat. At the time of the April visit, data was provided by Silmet representatives pertaining to the depth and nominal vertical dimension of the subterranean plume. This data was later disputed by Mr. Nosov in July after reviewing a draft report of the April USETI mission. But the presence of the spill and the need for remedial action is not disputed. Silmet representatives indicated the fuel oil spill had undergone some degree of characterization. They indicated the spill was the result of an isolated occurrence and that no ongoing release had been discovered. Silmet representatives offered no information on the status of characterization efforts, plume modeling, or remediation techniques under consideration.

The USETI technical team also recognized a waste minimization opportunity in recovery of the spilled fuel oil once it is removed from the ground. Provided the material can be adequately cleaned, it may be utilized as originally intended instead of disposed as a waste material.

2. The raw material storage yard was also recognized as a priority issue during by the USETI technical team. Materials are stored with limited or no protection from weather. Consequently, some materials have and are deteriorated in a manner that poses the risk of soil contamination and contaminated run-off due to heavy or toxic metals. Proposed solutions to this condition include: storage of materials under the protection of cover from weather; elevated storage platforms; storage inside covered facilities (i.e., warehousing); or modified procurement practices to reduce the amount of surplus raw stock held in the raw materials storage yard. Resolution of this issue may also produce a waste minimization achievement. Correct storage and procurement practices will help Silmet avoid excessive amounts of scrap material that must be disposed of because it failed to meet quality control requirements for raw materials. During USETI's meeting with Mr. Saksing on July 1st, he indicated that Silmet had requested raw material management assistance from the appropriate ministries of the government of the People's Republic of China.

3. Discharge of untreated acid cleaning process effluent to waste holding ponds was recognized as an operation that warranted prompt actions. Ongoing discharge contributes to Silmet's most significant environmental concern, waste pond remediation. Proposed solutions for consideration include acid reclamation through ion exchange; treatment by in-line or batch neutralization prior to discharge to waste ponds; and process modifications that minimize the amount of pollution generated by increasing the resident time of the materials being acid-cleaned and improves the contact between the surface of the material being cleaned and the acid solvent. Process modifications of this type would reduce the amount of acid consumed per unit of material cleaned.

4. During the April scoping mission, the USETI technical team was asked for an opinion on the prudence of constructing a port facility at a site adjacent to the existing waste ponds. Based on the limited information that has been made available to the USETI teams, an opinion was returned that construction of a port facility was not advisable. In the absence of hydrogeological information supporting the construction of a port facility, great caution should be exercised to avoid breaching the marginally adequate earthen retaining wall currently in place. Based on discussions with the USETI team in April, evidence of leaching from the waste ponds into the Baltic Sea has already been discovered. While no additional information was provided to USETI's technical team to corroborate the leaching, the suggestion of such contamination and an awareness of the questionable integrity of the pond and retention system elevate the need for a thorough engineering analysis and economic benefit study prior installing a port facility.

During the July USETI mission there was a suggestion that Silmet was considering using the port facility as an off-loading facility for incoming waste

shipments from other sites. RAS Silmet would serve as a waste repository for incoming shipments. Given the current management control needs, technology modernization requirements, uncertain economic future, and equal uncertainty in future ownership, utilization of RAS Silmet as a waste repository is ill-advised, at least until Silmet's own environmental matters are resolved and significant waste management expertise is established at RAS Silmet.

Mr. Saksing stated that the Estonian Ministry of Environment had allocated funds for port revitalization. He also stated that an east German contractor would be providing technical expertise. The PHARE Program was mentioned as a source of funding but it was unclear how such funding would be accessed. Scandinavian funding, possibly Danish, was also referred to, possibly for supporting the waste ponds' retaining walls. The breadth and depth of experience of the east German contractor in projects as environmentally sensitive as installing a port facility adjacent to a deteriorating waste retention pond system could not be assessed by the USETI team.

During Mr. Saksing's meeting with the USETI team in July, he mentioned that a strategic business plan was nearing completion for RAS Silmet. This plan should provide a full analysis (including risk analysis) and strategic impact of installing a port facility at Silmet in lieu, for example, of using the port facilities in Tallinn. The strategic business plan should also provide a full analysis of transitioning RAS Silmet to a waste repository as a part of the site's strategic objectives. RAS Silmet's strategic business plan should be independently validated by reviewers with expertise in facility utilization, environmental management, commerce and economics, and privatization. It should be noted that Mr. Saksing also announced that RAS Silmet had completed an environmental audit, a copy of which he held up although we could not get a copy. This was the first time we had been informed such an audit was being contemplated or under way.

Exclusion of the waste pond remediation as a key issue at Silmet is only to avoid redundancy. The condition and management of the existing waste ponds is recognized by many, including the USETI team, as the single most perilous environmental threat at RAS Silmet. Efforts should be undertaken without delay to stabilize and remediate these ponds in order to reduce the likelihood of catastrophic release. Additionally, characterization and monitoring programs should be instituted or upgraded to provide fundamental information necessary for effective pond management and informed decision-making. During Mr. Saksing's meeting with USETI on July 1st, he indicated that the Ministry of Environment has allocated funding for pond upgrades. The magnitude of the allocation was not disclosed. However, an allocation of funds is no guarantee of progress unless a well prepared remedial action plan is prepared based on sound engineering principals. Consideration should be given to utilizing the Ministry's allocation for development of such a plan.

Whereas the April USETI team was given the opportunity to familiarize themselves with RAS Silmet facilities, the July USETI team was not afforded such an opportunity. From a technical and instructional perspective, the failure to familiarize the July USETI technical team with Silmet diminished the benefit that would be gained by attendees at the workshop that was planned with Silmet's technical staff. Failure to familiarize the team would prevent workshop trainers from being able to draw correlations for Silmet attendees between workshop discussions and details of conditions existing at Silmet. Failure to familiarize would force trainers to rely on the recollections of the April USETI team, and some recollections had been disputed.

Although Mr. Saksing stated that a priority at Silmet was the training of site personnel in all topics, the USETI workshop, originally scheduled for two days, was reduced to little more than five hours of a lecture type presentation. During the five hours of lecture Mr. David Strayer of EnSafe Corporation addressed waste management planning. Mr. Terry Douglas of the EET Corporation provided a capsulized overview of waste minimization and pollution prevention, and occupational safety and health management. Presentations were attended by Mr. Korb, Mr. Nosov, and members of Silmet's technical staff.

IV. Technical Accomplishments

The technical accomplishments achieved during the July USETI mission were limited by the significant reduction in workshop schedule. However, two accomplishments do stand out:

1. At the conclusion of the abbreviated workshop, Mr. Nosov expressed a desire to sustain a collaborative relationship with USETI. He reiterated this desire again on Tuesday, July 2nd following the close-out briefing in Tallinn.
2. Mr. Nosov requested a proposal on proceeding with development and implementation of programs at Silmet to address the areas that were discussed during the abbreviated workshop at Silmet. The recommendations in the section V. of this report represent USETI's response to Mr. Nosov's request for proposal.

V. Recommendations

The following recommendations have been developed to assist RAS Silmet in improving environmental, and occupational safety and health management performance. However, selection of recommendations for implementation can only be done after site management's priorities are defined. Once priorities are defined, a graded-approach can be used to select and sequence those recommendations that support management's priorities.

The concept of a graded-approach addresses three primary factors: risk, severity and impact.

Risk: This factor includes risks of several varieties. Included are economic, technical, safety and health, environmental, schedule, and risks. When addressing risk in the graded-approach concept, a quantitative approximation of risk is developed for each of the alternative courses of action under consideration. An assessment of risk may be expressed as a ratio which communicates a likelihood of occurrence. For example, course of action A has an associated risk factor one anomalous event occurring in every ten thousand iterations (1:10,000), whereas course of action B presents a risk factor one anomalous event in one million iterations (1:1,000,000).

Severity: An assessment of the severity attempts to characterize the degree of injury or insult due to the occurrence of an anomalous event. For example, if the reasonably expected anomalous events occur in course of action A, three employees are likely to be killed. In course of action B, if the anomalous event occurs, some equipment may be damaged which can be repaired in a day.

Impact: When considering impact, an attempt is made to determine the impact if an anomalous event occurs. For example, in course of action A, if the anomalous event occurs, at least six months of production time will be lost due to facility shut down which will result in employees being laid off for six months and 50,000,000 EEK in revenues being lost. In course of action B, if the anomalous event occurs, a week of production time will be lost to repair damaged equipment. The workers are skilled in equipment repair. While a week of revenue will be lost, workers will not have to be laid off since they will be performing equipment repairs.

Theoretically, the graded-approach will highlight those corrective actions that will resulting the greatest reduction in risk, severity, and impact. But the graded-approach will be most useful once the Silmet management team defines the priorities for the site.

Recommendations include:

1. Establish an independent facility advisory committee (FAC) composed of leaders in the topics of: regional geopolitical affairs, technology, environment, public health, commerce, and any other disciplines being dealt with on a strategic level at RAS Silmet. This FAC will be utilized to evaluate and guide strategic planning performed by RAS Silmet's management team. This team will also be utilized to evaluate major projects undertaken at Silmet through the course of project planning and execution. The FAC will also assist RAS Silmet and the government of Estonia in establishing and managing a collaborative relationship.

2. **Consolidate the product(s) of all previously completed works at RAS Silmet and adjacent properties that addressed economic, environmental, or occupational safety and health subject matter.** These works may include preliminary site assessments, remedial action plans, design packages for work at Silmet that may effect the environmental management of the site, site characterization data, etc. There appears to be a high degree of redundancy of efforts by the different entities attempting to support Silmet. Consequently, valuable resources are being inefficiently utilized. Consolidation of work products will greatly enhance awareness of previously completed activities and go far to ensure an effectively diversified effort is maintained.

3. **Prepare and implement a plan for inventorying and characterizing all raw material consuming and waste generating processes conducted at RAS Silmet.** Process may include anything ranging from production processes to vehicle maintenance. Set interim milestones for identifying and characterizing a specific number of assessments each calendar quarter until every process has been evaluated. Evaluate new processes before they are implemented so necessary changes can be made early in the process development. While identification and characterization will be time consuming, it will be relatively low in cost since the knowledge base exists among the existing employee population. This recommendation includes the development of process flow diagrams and material balance sheets. The output of this recommendation will dramatically enhance RAS Silmet's ability to recognize inefficient processing and make necessary changes that will likely reduce material consumption and waste generation. Additionally, preparation of process flow diagrams and material balance sheets will enable RAS Silmet to more accurately assess impacts on operations due to facility or operational changes.

4. **Prepare a comprehensive waste management plan.** The plan should address the management of waste from the point of generation, through treatment, storage, and finally disposal. The scope of the plan should include: waste characterization, waste storage requirements, waste segregation, generation forecasting, and fiscal management.

5. **Prepare a waste minimization and pollution prevention plan for RAS Silmet.** The plan should provide guidance on awareness training for waste generators, procedures for minimizing waste and preventing pollution, and methods for identifying and assessing potential waste minimization and pollution prevention opportunities. The plan should also address procedures for implementing waste minimization and pollution prevention measures.

Success of a waste minimization and pollution prevention program can only be measured by comparison to program goals. Program goals should be established and renewed annually. Progress toward achieving goals should be evaluated periodically and causes for failure to meet goals should be identified and corrected. Examples of waste minimization and pollution prevention program goals include: a targeted percent reduction in the generation rate of a specific waste stream or set of streams; or a reduction in the ratio of raw materials consumed per unit of production. There are many different goals that can be set to measure success. But every goal must be reasonable and measurable.

6. Mr. Saksing and his management team should commit to the preservation of each employee's health and well being on the job. RAS Silmet's management team should communicate their commitment to the site's employee population with a clearly articulated policy defining Silmet's occupational safety and health program. Mr. Saksing and his management must demonstrate support for the occupational safety and health program by taking prompt and decisive actions intended to safeguard the workforce's health and well-being.

7. Prepare, implement, and annually update an occupational safety and health plan (OSHP) for RAS Silmet. The OSHP should address, as a minimum:

- * hazard identification
- * hazard surveillance
- * risk assessment
- * hazard inventory preparation and maintenance
- * hazard monitoring
- * hazard control
- * personal protective equipment
- * engineering controls
- * medical monitoring
- * employee training

During the abbreviated workshop at Silmet on Occupational safety and health management, Silmet's Director of Safety stated that his staff performs some hazard monitoring. He specifically mentioned noise dosimetry and air contaminant monitoring. However, he provided no information on the method his staff uses to select hazards which will be monitored. It is critical that, when only limited resources are available, a systematic method, such as a graded-approach, be utilized to identify the hazards with the greatest potential to cause harm to the worker for monitoring and control. For example, while excessive

noise exposure is hazardous to the worker and may result in hearing loss, exposures to carcinogens or teratogens would typically be considered a greater monitoring priority than noise due to the potentially fatal outcome of cancers or genetic damage to an unborn fetus.

VI. Conclusion

RAS Silmet's waste management and occupational safety and health programs appear to be in need of systematic management controls. While responsibility for the programs has been assigned, there is a general lack of understanding of systematic management and goal-oriented systems necessary to achieve success in these disciplines. Additionally, the geopolitical conditions in the region adversely influence the technical performance of the business in the waste management, and safety and health arenas. Competing agendas and opposing commitments and allegiance are retarding technical achievement. However, there do appear to be individuals within the Estonian ministries working with Silmet and within Silmet's management team who recognize the potential synergy that could exist through collaboration between Estonia and RAS Silmet. Success through collaboration will:

- * serve as a prototype for future interaction between Estonian industry and government;
- * enhance the commercial viability of Silmet; and
- * aid the stabilization of a major industrial site within the Estonian industrial base.

While at Silmet and in Tallinn, there was considerable reticence about initiating any new actions at Silmet, such as the recommendations contained within this summary report, until site ownership is decided. To the contrary, it is the opinion of the USETI technical team that, given the ongoing existence of RAS Silmet, any actions taken beginning immediately only improve the chances for viability in the future regardless of ownership. The recommendations described in this report target improved environmental stewardship, improved waste management practices, reduction of waste generation and pollution, and improved worker protection practices. Any and all of these recommendations only contribute to improved operations of the RAS Silmet site. Improved, efficient, and cost effective operations can only be viewed positively by any owner. Reasons for not implementing recommendations such as those contained within this report are likely to be non-technical, which are not addressed by this report.