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Standard Guide for Qualitative Observations of Skimmer Performance[1]

This standard is issued under the fixed designation F2008; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers evaluating a number of qualitative performance parameters for full-scale oil spill removal systems or individual components of those systems. It is intended to complement the quantitative testing covered in Guide F631.

1.2 This guide is intended for potential purchasers of oil spill removal equipment to ensure that suppliers meet their needs and expectations.

1.3 This guide requires a subjective evaluation that could vary widely when completed by different organizations. As such, its main use would be as a means of comparing different skimmers for a particular organization or application.

1.4 Not all of the items in this guide would apply to a particular skimmer or to a particular cleanup application. Prior to using this guide, users should carefully review the entire contents and note those areas that are most important to their needs. In particular, qualitative evaluation of items such as workmanship of construction may not be applicable to prototype skimmers.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific safety precautions are given in Section 9.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F625 Practice for Classifying Water Bodies for Spill Control Systems

F631 Guide for Collecting Skimmer Performance Data in Controlled Environments

F1607 Guide for Reporting of Test Performance Data for Oil Spill Response Pumps

3. Terminology

3.1 *Definitions:*

3.1.1 *production skimmer*—full-scale device supplied for testing and indicated by the manufacturer to be commercially available.

3.1.2 *prototype skimmer*—device indicated by the developer or manufacturer, or both, as being in the developmental stage and not for sale on the commercial market.

3.1.3 *qualitative performance data*—characteristics recorded during the evaluation period other than those specified by Guide F631.

4. Significance and Use

4.1 This guide provides procedures enabling the recording of qualitative performance information under controlled test conditions. This information can be used together with quantitative data to comprehensively evaluate a particular spill removal device or as a means of comparing two or more devices.

4.2 Although the qualitative assessment described in this guide can be somewhat subjective, it is an important part of the overall evaluation of a spill removal device. This guide covers performance factors other than recovery rate and efficiency that will affect the device's performance in an actual spill. Their consideration allows the comprehensive evaluation or comparison of spill removal devices.

4.3 Caution must be exercised whenever test data are used to predict performance in actual spill situations as the uncontrolled environmental conditions that affect performance in the field are rarely identical to conditions in the test tank.

4.4 Portions of this guide are specifically intended for skimmers with hydraulic power supplies. This is not intended to limit application of this guide to skimmers with other power supplies such as electric or pneumatic.

5. Summary of Guide

5.1 The spill removal device may be tested in a wave/tow tank, flume or other facility that is suitable for observing and recording appropriate operational performance factors. Significant testing results can be obtained using simple test tanks or

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

ponds, particularly when calm water, stationary or low velocity advancing tests are desired as an economical means to screen or compare devices.

5.2 It is essential that the test device be operated in a steady-state condition during the evaluation period so that operational performance factors can be consistently monitored, evaluated and recorded.

5.3 Examination of qualitative performance factors can be obtained at any of the facilities described above and will entail assessment before, during and after quantitative testing.

6. Interferences

6.1 The reporting of results shall address the possibility of test facility effects. For example, wall effects may interfere hydrodynamically with the performance of a device.

6.2 Care should be taken so that any containment apparatus not designed specifically for the skimming device does not affect the distribution of test fluid to the device or its ability to recover the test slick. Similarly, skimmers should be tethered in a way that does not interfere with performance.

7. Test Facilities

7.1 Several types of test facilities can be used to carry out the performance evaluations outlined in this guide.

7.1.1 *Wave/Tow Tank*—A wave/tow tank has a movable bridge or other mechanism for towing the test device through water for the length of the facility. A wave generator may be installed on one end, or on the side of the facility, or both.

7.1.2 *Current Tank*—A current tank is a water-filled tank equipped with a pump or other propulsion system for moving the water through a test section where the test device is mounted. A wave generator may be installed on this type of test facility.

7.1.3 Other facilities, such as private ponds, tanks, or flumes may also be used, provided the test parameters can be suitably controlled.

7.2 Ancillary systems for facilities include, but are not limited to, a distribution system for accurately delivering test fluids to the water surface, skimming systems to assist in cleaning the facility between tests, and adequate tankage for storing the test fluids.

7.3 Additional capabilities at the test facility should also include: the space, materials and tools necessary to effect assembly, maintenance and minor repairs of test devices; the means to safely lift test devices for deployment and retrieval; and platforms and walkways to facilitate observation, sampling, and written, photographic and video recording.

7.4 These qualitative observations can be made during quantitative testing in accordance with Guide F631, or in the field during exercises and response operations provided that appropriate records are kept.

8. Test Fluids

8.1 Test fluids for use with this guide should be selected to fall within the parameters of those listed in Guide F631. These test fluids may be crude, refined, or simulated.

9. Safety Precautions

9.1 Test operations shall conform to established safety and regulatory requirements for test facility operations and test fluid handling. Particular caution must be exercised when handling flammable or toxic test fluids, refueling motors, and deploying and retrieving test devices from the test tank.

9.2 Test operations shall also employ the safety precautions recommended by the manufacturers of devices and equipment employed during testing.

10. Equipment Operation

10.1 The test device shall be deployed in accordance with facility operating characteristics.

10.2 The device must be operated in accordance with the manufacturer's specified operating instructions with respect to mechanical operations, safety, and established maintenance routines. A representative of the manufacturer should be invited to participate in the initial setup and training of testing personnel.

10.3 Modifications to the device prior to or during the course of testing should not be done except in consultation with the manufacturer.

10.4 Modifications to the device, in any form that differs from the supplied test device, shall be recorded with the test results.

11. Test Variables and Qualitative Performance Factors

11.1 The test evaluator shall review and indicate the performance factors and methods selected for evaluation.

11.2 Qualitative performance evaluation should be conducted coincident with quantitative testing. Quantitative test procedures should be followed as specified in 12.1 to 12.4 of Guide F631 for the operation of the test tank, distribution of test fluid, and collection of numerical data.

12. Pre-Deployment

12.1 Prior to testing:

12.1.1 Review the manufacturer's reference materials and all items received for testing.

12.1.2 Verify that supplied components, including fittings, hoses and materials, are in accordance with the manufacturer's specifications. Any adaptations to meet the requirements of the test facility should be noted.

12.1.3 Record in detail all significant differences between the technical specifications of the model tested and those of production models.

12.1.4 Mathematically compute the power balance of major components to determine if the drive provided by the prime mover adequately serves the power needs of the pump, recovery mechanism and other components. Provide specific computations, if possible, indicating total brake horsepower available and needed, system hydraulic pressure, hydraulic fluid flow rate, and operating temperature range.

12.1.5 If the skimmer being tested is designed to operate as a complete system the device should be presented for testing as a 100 % complete system with all of the necessary items for deployment and operation.

12.1.6 List any required modifications necessary to integrate components and render the system fully functional for testing.

12.2 *Reference Materials*:

12.2.1 List all documents received with the skimming system, and assess operation manuals for content, clarity, and practicality of use.

12.2.1.1 Note the use of clearly-labeled graphics and photographs.

12.2.1.2 In cases where the documentation is a translation of the original, note any areas of confusion or contradiction and be alert for any possible errors.

12.2.1.3 Indicate the inclusion of an index, organization of the documents, quality of print and instructions which facilitate use of documents for reference purposes.

12.2.1.4 Determine if a concise, all-weather field guide is available.

12.2.1.5 Ensure that operational and safety placards are appropriate, match operating procedures, and protect the operator.

12.3 Record whether the following items are satisfactorily addressed:

12.3.1 *Components*:

12.3.1.1 Complete listing of all components for specific model provided,

12.3.1.2 Technical specifications, and

12.3.1.3 Spare parts list.

12.3.2 *Assembly and Set-Up*:

12.3.2.1 Detailed and easily understood assembly instructions,

12.3.2.2 Diagrams or photographs to assist in assembly,

12.3.2.3 Standard tools required for assembly,

12.3.2.4 Special tools required for assembly,

12.3.2.5 Preparation required for operation, set-up and deployment,

12.3.2.6 Component and assembly weights, and

12.3.2.7 Lifting and handling requirements.

12.3.3 *Operation*:

12.3.3.1 Proper method of operation, including recommendations for optimal settings or guidance for achieving such settings,

12.3.3.2 Required types and quantities of fuel, oil, and other fluids,

12.3.3.3 Guidelines for safe operations,

12.3.3.4 Required procedures for retrieval, and

12.3.3.5 The appropriate methods for cleaning and decontamination including appropriate cleaning agents and the maximum temperatures or pressures, or both, allowable for hot-water or high-pressure cleaning.

12.3.4 *Storage, Maintenance, and Repair*:

12.3.4.1 Required procedures for storage,

12.3.4.2 Required procedures and recommended time intervals for maintenance and repair,

12.3.4.3 Guidelines for troubleshooting and suggested repair for major and minor problems, and

12.3.4.4 Disassembly and assembly procedures.

12.4 *Manufacturer Representation and Support Services*—Record and verify the terms and conditions of the warranty, and the availability of parts and service within the region. List all support services available through the manufacturer or regional distributor.

12.5 *Owners Survey*—For tests warranting a detailed assessment of operational and mechanical reliability, conduct a survey of past and present owners of the system being tested; this will provide a comprehensive account of performance to complement results achieved during short-term tank testing.

12.6 *Existing Test Reports*—Prior to testing, obtain and review any previously written evaluations of the test device, paying particular attention to test fluid types, methodologies, and qualitative/quantitative assessment criteria utilized. Where possible, consult with operational groups on short- and long-term findings relevant to the subject areas covered in this Guide.

13. Construction and Assembly

13.1 During initial assembly and set-up, evaluate the overall quality of construction and design, materials and fittings, overall ruggedness, assembly, and maintenance and repair.

13.2 *Overall Quality of Construction and Design*—Test personnel should be critical of any design features that could result in diminished skimmer performance or operator control. Pay particular attention to features that could create a safety hazard for operators or others working in the immediate vicinity such as exposed rotating parts, or hot surfaces.

13.2.1 Assess the overall quality of workmanship of the system during the test by visual inspection and reporting of the following:

13.2.1.1 Relative simplicity or complexity of design,

13.2.1.2 Potential safety hazards such as sharp protrusions, rough edges, weak lifting points or unsafe pump/powerpack configuration or design,

13.2.1.3 Overall size re: transportation and operation,

13.2.1.4 Logical placement and reasonable access to components for inspection and service, and

13.2.1.5 Compatibility of system components: do they work well together, or are they mismatched and inappropriate. (For example: skimmers designed for light oil recovery should not be equipped with a (sparking) gasoline engine; an oversized discharge port and bulky hose may lead to difficulties in handling, tethering and priming; skimmers intended for use with highly viscous oil should have a large diameter transfer hose).

13.2.2 If appropriate, use non-destructive testing or quality assurance system or regulatory certification to assess the structural integrity of the skimmer.

13.3 Design criteria should be considered when assessing equipment as follows:

13.3.1 *Safety-Related*:

13.3.1.1 The location of the exhaust in relation to the operator's position and reach,

13.3.1.2 The location of hot surfaces in relation to the operator,

13.3.1.3 Fueling access point for convenience and safety,

13.3.1.4 Covers fitting appropriately over all exposed moving parts such as belts, chains, or couplings,

13.3.1.5 Battery and controls enclosures that are effectively weatherproofed and vented, and

13.3.1.6 Non-flexible fuel lines must be well fastened, and properly protected.

13.3.2 *Operational*:

13.3.2.1 The markings for controls must be clear and easily understood,

13.3.2.2 An hour counter to track powerpack usage for maintenance,

13.3.2.3 An adequately sized hydraulic reservoir, or hydraulic cooling system, to avoid overheating,

13.3.2.4 Gages showing the levels of hydraulic fluid and diesel fuel that are clearly visible to the operator,

13.3.2.5 A bypass on the hydraulic system that allows warm-up so that hydraulic fluid does not load the system or spill over a relief valve,

13.3.2.6 One or more of: automatic shutoff, audible alarm, or warning lights to indicate high engine temperature, low engine lubrication pressure, charging, or other problems,

13.3.2.7 Lubrication points that are safe and easily accessible to the operator,

13.3.2.8 A hydraulic pressure compensator to provide pressure balancing when setting either pump speed or pickup mechanism rates,

13.3.2.9 Corrosion protection for equipment with dissimilar metals, and

13.3.2.10 Rubber mounting on engine and pumps to minimize vibration.

13.3.3 *Handling and Storage*:

13.3.3.1 Devices that have tires must include a stop mechanism to limit movement,

13.3.3.2 Tire stops should not interfere with forklift pickup sockets or with uneven terrain,

13.3.3.3 Adequate side cover panels to avoid damage for powerpacks,

13.3.3.4 Tethering cleats to allow securing on board a vessel, and

13.3.3.5 Covers and enclosures that are easily removed and installed.

13.3.4 Note the method of starting diesel engines:

13.3.4.1 Note ease and reliability of starting (electric start vs. hand crank or hydraulic accumulator),

13.3.4.2 Depending on the application, assess the ability for cold-weather starting and/or long-term operation in hot weather,

13.3.4.3 Engines requiring a crank start usually include a decompression lever. Preferred models do not require the simultaneous turning of the crank and manual depression of the lever, and

13.3.4.4 In some cases, hydraulic or mechanical start systems would be better suited to the operational requirement, and would eliminate the need for battery maintenance.

13.3.5 Assess the suitability and design of hydraulic hoses, discharge/suction hoses, and connectors:

13.3.5.1 Lengths, weight, type, and durability,

13.3.5.2 Protectors attached to hydraulic connectors,

13.3.5.3 Quality of hydraulic connectors,

13.3.5.4 Means of relieving pressure when joining hydraulic connectors,

13.3.5.5 Diameter of hydraulic hoses re: heat development and pressure loss,

13.3.5.6 Use of layflat or semi-rigid discharge hose,

13.3.5.7 Compatibility of suction and discharge hoses re: chemical, oil, salt water, service temperatures,

13.3.5.8 Use of adapters to effect connections, and

13.3.5.9 Connection/disconnection of discharge & hydraulic lines above water, and

13.3.5.10 Type and size of connectors (Camlock, screw-on, other).

13.4 *Materials and Fittings*:

13.4.1 Assess the quality, durability and compatibility of materials:

13.4.1.1 Visually inspect all components prior and subsequent to quantitative testing. Identify any components that are poorly constructed, selected or fitted.

13.4.1.2 List and evaluate the location number and size of all critical fittings such as forklift sockets, eyebolts, tethering cleats, handles, boom attachments, and line/hose connections for each component including the skimming head, powerpack and pump.

13.4.1.3 Unique design features should also be specifically indicated.

13.4.2 Note specific features that appear to be unsafe, prone to damage or deterioration, difficult to assemble, or otherwise inappropriate. For example, thumbscrews used to position flotation buoys, rope handles, or spot-welding to fasten critical (high stress) joints should be clearly identified if they have the potential to fail during deployment and operation.

13.4.3 Identify any points within the system subject to electro-chemical corrosive action, particularly at fittings that require connection, disconnection or periodic adjustment.

13.4.4 There should be no damage or wear to moving parts evident prior to testing, particularly with the oil pickup mechanism and associated hardware. Bolts in the frame, scrapers, and pumps should be checked for tightness. The alignment of any couplings, belts, and chains should be checked. Hydraulic motors and pumps should be run in prior to testing.

13.5 *Overall Ruggedness*:

13.5.1 Assess potential resistance to damage under typical spill response conditions. Note features that appear susceptible to impact or abrasion, or to deterioration due to exposure to UV light, hydrocarbons, chemicals, saltwater, extreme temperatures, humidity, dirt, dust or debris:

13.5.1.1 Expose skimmer to oil, saltwater and sunlight for a continuous period, not less than five days.

13.5.1.2 Do not wipe down exposed skimmer surfaces during the five-day period.

13.5.1.3 Record all instances of deterioration immediately following the five-day period of exposure and subsequent to cleaning.

13.5.2 Examples of materials prone to degradation include:

13.5.2.1 Flexing rubber parts (which can deteriorate during use and storage),