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# Preliminary Data Summary for Industrial Container and Drum Cleaning Industry

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# 1.0 EXECUTIVE SUMMARY

This Industry Profile Report provides information about the Industrial Container and Drum Cleaning (ICDC) industry, including the practices and technologies used by the industry to control pollutant discharges to U.S. surface waters and publicly-owned treatment works (POTW). EPA conducted this study of ICDC operations to increase its understanding of the industry and to provide data to facilitate a decision as to whether or not national categorical effluent limitations guidelines and standards should be developed for this category of dischargers.

The ICDC industry includes facilities that clean and recondition metal and plastic drums and intermediate bulk containers (IBCs) for resale, reuse, or disposal. ICDC facilities can be further classified as facilities that either burn open-head steel drums or wash plastic or tight-head (i.e., bung-type) steel drums and IBCs. Most ICDC facilities purchase used drums or containers that they clean and recondition for resale.

EPA estimates a total ICDC industry population of 291 facilities. These include an estimated 118 ICDC facilities that do not clean transportation equipment, and an estimated 173 ICDC facilities that also clean transportation equipment (based on 1994 data). Available data suggest that IBC use and reconditioning has grown significantly in the 1990s, and continued growth is expected in the future. Both transportation equipment cleaning (TEC) facilities and drum reconditioning facilities consider the IBC cleaning business as an important growth market; therefore, ICDC industry growth consists of installing new IBC washing lines at existing drum washing and TEC facilities. Future growth or decline in the drum reconditioning market is expected to equal growth or decline in the general chemical industry.

ICDC facilities often report under 1987 Standard Industrial Classification code 7699 (Repair Shops and Related Services, Not Elsewhere Classified). The Reusable Industrial Packaging Association (RIPA) estimates that 60% of their member ICDC facilities (i.e., ICDC facilities that do not clean transportation equipment) are classified as small businesses (size

cutoff unknown). In contrast, EPA estimates 30% of transportation equipment cleaning facilities (which include at least 173 ICDC facilities) are small businesses (annual revenues less than $5 million).

EPA estimates total production by the ICDC industry as follows:

| Container Type | Number Reconditioned/Year |
|---|---|
| Steel Drums | 11.0 million tight-head<br>20.2 million open-head |
| Plastic Drums | 7.6 million tight-head<br>664,000 open-head |
| IBCs | 500,000 plastic and steel |

The most significant uses of water associated with drum and container washing operations include interior preflush, hot water washes and rinses, exterior washing, and formulation of cleaning solutions. Wastewater is generated primarily through drum and IBC washes and rinses. At drum burning facilities, water is used mainly in the quenching stage of the drum burning process, and most quench water is lost to evaporation. Some drum burning facilities rinse drums prior to painting; at these facilities, rinse water is the predominant water use and source of wastewater. Other wastewater sources at ICDC facilities include leak testing, air pollution scrubber wastewater, paint booth water curtain wastewater, and storm water runoff.

EPA believes that most ICDC facilities discharge ICDC wastewater and that all or almost all of these facilities discharge indirectly to a POTW. EPA has not identified any facilities that discharge directly to surface waters. EPA also believes that a portion of the industry achieves zero discharge by hauling the wastewater to a centralized waste treatment facility, or disposing of the wastewater by land application or evaporation. Alternatively, some ICDC facilities achieve zero discharge by recycling or reusing 100% of its wastewater. EPA estimates that the total annual volume of wastewater generated by the ICDC industry is 295 million gallons, including 200 million gallons from drum washing, 45 million gallons from drum burning, and 50 million gallons from IBC cleaning.

Primary sources of pollutants in ICDC wastewater include residual material, heel, in the drums and containers, as well as carry-over and spent chemical cleaning solutions. Drums and IBCs are used to transport thousands of different cargos, including oil, solvents, paint, resins, chemicals, lacquers and varnishes, adhesives, cleaners, and food. Open-head drums are better suited to transport viscous liquids, powders, or slurries than tight-head drums and IBCs.

For this study, EPA conducted site visits to three drum cleaning and reconditioning facilities, including one facility that also cleans plastic containers, in order to assess ICDC wastewater characteristics. In addition, in 1989, EPA completed a preliminary data summary for the drum reconditioning industry. Based on the sampling results from both studies, EPA detected over 100 pollutants in ICDC wastewater, including volatile and semivolatile organics, dioxins and furans, pesticides and herbicides, metals, and classical pollutants. In general, except for dioxins and furans, pollutant concentrations in steel drum washing wastewater are comparable to or greater than those in steel drum burning wastewater. In general, pollutant concentrations in plastic drum and IBC cleaning wastewater are significantly less then those in steel drum washing and steel drum burning wastewaters. Raw wastewater pollutant loadings (in pounds) are predominantly (80% to 99%) contributed by classical pollutants such as chemical oxygen demand, solids, oil and grease, and biochemical oxygen demand. Metals contributed approximately 1% to 20% of raw wastewater pollutant loadings, and volatile and semivolatile organics contributed approximately 0.2% to 3% of pollutant loadings. EPA estimates that raw wastewater pollutant loadings for the ICDC industry range from 46 million to 77 million pound-equivalents per year.

End-of-pipe wastewater treatment technologies commonly used by ICDC facilities visited in 2000 and in the mid-1980s include equalization, pH adjustment, gravity settling, oil/water separation; chemical precipitation followed by clarification or air flotation, and sludge dewatering. More than half of respondents to a 2000 survey of RIPA members reported having on-site wastewater treatment. However, the survey responses do not provide specific treatment technologies used by these facilities.

## 2.0 INTRODUCTION

Effluent limitations guidelines and standards (or "effluent guidelines") are technology-based national standards that are developed by EPA on an industry-by-industry basis, and are intended to represent the greatest pollutant reductions that are economically achievable for an industry. These limits are applied uniformly to facilities within the industry scope defined by the regulations regardless of the condition of the water body receiving the discharge. To address variations inherent in certain industries, different numeric limitations may be set for groups of facilities (i.e., subcategories) within the industry based on their fundamental differences, such as manufacturing processes, products, water use, or wastewater pollutant loadings. The limits and standards that are developed are used by permit writers and control authorities (e.g., publicly owned treatment works or "POTW") to write wastewater discharge permits. The permits may be more stringent due to water quality considerations but may not be less stringent than the national effluent guidelines. EPA has issued national technology-based effluent guidelines for over 50 industries.

In the mid-1980s, EPA conducted studies of the drum reconditioning and the transportation equipment cleaning (TEC) industries to determine whether national categorical effluent limitations guidelines and standards should be developed for these categories of dischargers. In the case of the TEC industry, EPA promulgated effluent limitations guidelines and standards in June 2000 (65 FR 49665). During development of the TEC rule, information submitted by commenters indicated that there was some overlap in the TEC and the drum reconditioning industries. Specifically, intermediate bulk containers (IBCs), which are portable plastic and metal containers with 450 liters (199 gallons) to 3,000 liters (793 gallons) capacity, were cleaned by facilities in both industries. This was a significant finding because the number of IBC cleanings has increased dramatically since the early 1990s. In the case of the drum reconditioning industry, EPA concluded at that time that the industry did not merit national regulation. In addition, for the drum reconditioning industry study in the mid-1980s, EPA did not collect any data on IBC cleaning because so few IBCs were being used by the industry at that time.

EPA had originally considered including IBCs in the scope of the TEC rule because many TEC facilities also clean IBCs. EPA obtained some IBC data from the data collection phase of the rule (through screener and detailed questionnaires) in 1994. EPA also received public comments on IBCs during proposal regarding their similarities and differences to tanks versus drums, and performed site visits, at the request of commenters, at two TEC facilities that also clean and recondition IBCs. IBC wastewater was later removed from the scope of the TEC rule because EPA's assessment suggested IBC cleaning wastewater was more similar to drum cleaning wastewater than to TEC wastewater.

Currently, facilities that clean industrial drums and containers may be regulated under other effluent guidelines. For example, manufacturing facilities covered by other categorical limitations and standards may clean and recondition drums and containers. In addition, under the Metal Products and Machinery (MP&M) rule which was proposed on January 3, 2001 (66 FR 424), EPA proposed and requested comment on including wastewater generated by metal drum and IBC reconditioning/refurbishing in the scope of the MP&M rule. The MP&M rule proposed to cover wastewater generated by the unit operations performed on metal drums and/or IBCs such as chaining, caustic washing, acid cleaning, acid etching, impact deformation, leak testing, corrosion inhibition, shot blasting, and painting. In the proposal, the Agency considers facilities that perform these operations as part of the Stationary Industrial Equipment sector under the MP&M rule. EPA is currently evaluating comments submitted in response to the proposed MP&M rule. Alternatively, EPA is also evaluating regulating facilities that recondition/refurbish and clean metal and plastic drums and containers such as IBCs as a separate industrial category, referred to as the industrial container and drum cleaning (ICDC) industry.

The U.S. Environmental Protection Agency (EPA) is required by Section 301(d) of the Federal Water Pollution Control Act Amendments of 1972 and 1977 (the "Act") to review and revise every five years, if appropriate, effluent limitations promulgated pursuant to Sections 301, 304, and 306. EPA conducted this study of ICDC operations to increase its understanding of the industry and to provide data to facilitate a decision as to whether or not national categorical effluent limitations guidelines and standards should be developed for this category of

dischargers. EPA collected and reviewed data from numerous sources to increase its understanding of the following technical issues related to ICDC operations: ICDC processes, wastewater generation, wastewater collection and handling, and pollution prevention/treatment technologies. This document describes these findings in the sections listed below. Note that if EPA develops regulations for the ICDC industry, the Agency would cover metal drum and IBC reconditioning/refurbishing facilities under the ICDC regulation rather than under the MP&M regulation.

- Section 3.0 - Data-Collection Activities;
- Section 4.0 - Industry Description;
- Section 5.0 - Water Use and Wastewater Characterization;
- Section 6.0 - Pollution Prevention and Wastewater Treatment Technologies;
- Section 7.0 - Comparison of the Drum Reconditioning and Transportation Equipment Cleaning Industries;
- Section 8.0 - Compliance Costs and Pollutant Load Removals;
- Section 9.0 - Trends in the Industry;
- Section 10.0 - Glossary.

# 3.0 DATA-COLLECTION ACTIVITIES

EPA collected data from a variety of sources, including existing data from previous EPA data-collection efforts, industry-provided information, and site visit and sampling data. Each of these data sources and its use in this study is discussed below, as well as the quality assurance/quality control (QA/QC) and other data-editing procedures. Summaries and analyses of the data collected by EPA are presented in the remainder of this document.

The following topics are discussed in this section:

- Section 3.1: Discusses the 1989 Preliminary Data Summary for the Drum Reconditioning Industry;
- Section 3.2: Presents relevant information obtained from the Transportation Equipment Cleaning Industry record;
- Section 3.3: Describes EPA site visits and sampling in 2000;
- Section 3.4: Discusses industry-submitted data;
- Section 3.5: Discusses technical literature;
- Section 3.6: Discusses other data sources; and
- Section 3.7: Presents the references used in this section.

## 3.1 1989 Preliminary Data Summary for the Drum Reconditioning Industry

EPA conducted a study of the drum reconditioning industry and published a report in 1989 documenting its findings. The study was a result of findings from the Domestic Sewage Study that the quantity of hazardous wastes generated and discharged to publicly owned treatment works (POTWs) by the drum reconditioning industry was unknown. For this study, EPA performed site visits at 16 facilities and sampling at four drum reconditioning facilities that did not clean IBCs. Analyses were conducted for over 400 conventional, nonconventional, priority, and non-priority pollutants. The study also relied heavily on responses to a 1980

membership survey conducted by the National Barrel and Drum Association (now the Reusable Industrial Packaging Association (RIPA)).

EPA used this study to collect information about the drum cleaning segment of the ICDC industry, in particular, descriptions of drum cleaning and reconditioning operations to supplement the industry description, and wastewater pollutant concentrations and loadings for comparison to more recent sampling data and for use in estimating raw industry wastewater pollutant loadings and pollutant removal estimates.

## 3.2 Transportation Equipment Cleaning Industry Record

EPA promulgated effluent limitations guidelines and standards for the Transportation Equipment Cleaning Point Source Category in August 2000 for the discharge of pollutants into waters of the United States and into POTWs by existing and new facilities that perform transportation equipment cleaning operations. Transportation equipment cleaning (TEC) facilities are defined as those facilities that generate wastewater from cleaning the interior of tank trucks, closed-top hopper trucks, rail tank cars, closed-top hopper rail cars, intermodal tank containers, tank barges, closed-top hopper barges, and ocean/sea tankers used to transport materials or cargos that come into direct contact with the tank or container interior.

EPA searched the rulemaking record for this point source category for information on facilities that clean intermediate bulk containers (IBCs) in addition to other tanks or containers (e.g., tank trucks). EPA had originally considered including IBCs in the scope of the TEC rule. EPA obtained some IBC data from the data collection phase of the rule (through screener and detailed questionnaires) in 1994. EPA also received public comments on IBCs during proposal regarding their similarities and differences to tanks versus drums, and at the request of commenters performed site visits at two TEC facilities that also clean and recondition IBCs. IBCs were later removed from the scope of the TEC rule because EPA's assessment suggested IBC cleaning wastewater was more similar to drum cleaning wastewater than to TEC wastewater.

## 3.3 EPA Site Visits/Sampling in 2000

In order to increase its understanding of the ICDC industry, EPA conducted site visits at representative ICDC facilities. EPA used information collected from literature searches and contact with trade association members to identify representative facilities for site visits. RIPA worked with their membership to suggest three facilities willing to participate in EPA's sampling program. In general, these facilities encompassed the range of ICDC operations, wastewater characteristics, and wastewater treatment practices. The first facility is in the eastern United States and performs plastic drum and IBC washing. The second facility is in the midwestern United States and performs steel drum washing and burning, and the third facility is also in the midwestern United States and performs steel drum washing.

Facility-specific selection criteria are contained in site visit reports (SVRs) prepared for each facility visited by EPA. During the site visits, EPA collected the following information:

- General facility information, including size and age of the facility;
- A general description of ICDC operations;
- Wastewater characterization information;
- On-site wastewater treatment data, including the treatment technologies used, treatment costs, monitoring, discharge, and permit information; and
- Economic information.

This information is documented in the SVR for each facility.

During the study, EPA conducted one-day sampling episodes at three facilities (those facilities which EPA site visited) for raw wastewater characterization. The Agency collected the following grab samples during each site visit:

- Influent to wastewater treatment;
- Trip blanks; and
- Duplicate wastewater sample (one sample at one facility).

The following classes of pollutants were analyzed:

- Volatile organics;
- Semivolatile organics;
- Metals;
- Pesticides/herbicides;
- Dioxins/furans;
- Hexane extractable material (HEM);
- Silica-gel treated hexane extractable material (SGT-HEM);
- Biochemical oxygen demand, 5-day ($BOD_5$);
- Total suspended solids (TSS);
- Chloride;
- Total organic carbon (TOC);
- Chemical oxygen demand (COD);
- Ammonia as nitrogen;
- Nitrate/nitrite as nitrogen;
- Total phosphorus; and
- Total cyanide.

Section 5.4 of this report discusses the results of EPA's wastewater characterization sampling effort.

During the sampling period, field measurements of temperature, pH, and free chlorine were collected for each sample point. Waste stream flow, production data (e.g., number and types of containers cleaned), and any information on non-ICDC operations that generate wastewater that is commingled with ICDC wastewater were also collected when available.

During each sampling episode, EPA collected and preserved samples and shipped them to EPA contract laboratories for analysis. Sampling collection and preservation were performed according to EPA protocols as specified in the Quality Assurance Project Plan for Field Sampling and Analysis - Industrial Container and Drum Cleaning Industry (QAPP) (1) and the EAD Sampling Guide (2).

EPA collected the required types of quality control samples as specified in the QAPP, such as trip blanks and duplicate samples, to verify the precision and accuracy of sample analyses. The list of analytes for each episode, analytical methods used, and the analytical results, including quality control samples, are included in the Sampling Episode Report prepared for each sampling episode.

## 3.4 Industry-Submitted Data

EPA made several contacts with members of RIPA, which is the primary trade association for drum reconditioning facilities. EPA obtained anecdotal process and production information, as well as facility wastewater discharge practices. EPA used the information obtained from facilities and from RIPA throughout its analyses and incorporated it into this report.

RIPA also provided EPA a summary of the results of a membership survey conducted in 2000 which included data for certain process operations, wastewater management, and hazardous waste management. Surveys were sent to 98 RIPA members engaged in the reprocessing of steel and plastic drums, as well as IBCs, and 36 survey responses were submitted.

## 3.5 Literature

EPA performed several Internet and literature searches to identify applicable materials for use in the study. Literature sources were identified using the Dialog® service. The

literature collected discussed trends in the ICDC industry and information about specific ICDC facilities. EPA used these data to supplement this report.

EPA reviewed the Hazardous Cargo Bulletin International Drum & IBC Guide, which is an international directory of drum, IBC, and other industrial packaging producers to determine population estimates. EPA also reviewed two industry trade journals, Hazardous Cargo Bulletin and Modern Bulk Transporter, for additional information on the ICDC industry.

EPA reviewed The Future of the IBC Market, a Hazardous Cargo Bulletin report, which describes many aspects (technical and economic) of the IBC industry (3). EPA also reviewed Assessment of Combustion Sources that Emit Polychlorinated Dioxins and Furans, Polycyclic Aromatic Hydrocarbons, and Other Toxic Compounds, which presents air emissions characterization data for drum burning processes (4).

## 3.6 Other Data Sources

EPA made several phone calls to facilities in the Hazardous Cargo Bulletin that were not confirmed by RIPA as reconditioning facilities to verify whether they were ICDC facilities and to assist in the preparation of population estimates.

## 3.7 References

1. Eastern Research Group, Inc. Quality Assurance Project Plan for Field Sampling and Analysis - Industrial Container and Drum Cleaning Industry, August 2000 (DCN D00104).

2. Viar and Company. EAD Sampling Guide. June 1991 (DCN D00115).

3. Dixon, B., The Future of the IBC Market - A Hazardous Cargo Bulletin Report, Intapress Publishing Ltd. London, England, 2000 (DCN D00008).

4. Midwest Research Institute. Assessment of Combustion Sources that Emit Polychlorinated Dioxins and Furans, Polycyclic Aromatic Hydrocarbons, and Other Toxic Compounds, PB94-129871. January 1992 (DCN D00146).