Economics of Conversion to Mercury-Free Products
Final Draft

UNEP DTIE Chemicals Branch

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Executive Summary

The United Nations Environment Programme (UNEP) Chemicals Branch works to protect humans and the environment from adverse effects caused by chemicals throughout their lifecycle, including hazardous waste. Mercury is considered a chemical of global concern due to its long-range transport in the atmosphere, its persistence in the environment, its ability to bioaccumulate in ecosystems and its significant negative effect on human health and the environment. UNEP has been working to address issues associated with the use of mercury since 2003. Governing Council 25/5 called for the elaboration of a legally binding instrument on mercury with negotiations that commenced in 2010 and planned to be finalized in 2013. The third session of the Intergovernmental Negotiating Committee to prepare a global legally binding instrument on mercury is planned to take place at UNEP Headquarters in Nairobi, from 31 October to 4 November 2011. This study was commissioned in July 2011 by the UNEP Chemicals Branch with study results aimed to inform the negotiations.

This report provides information from case studies of two firms involved with transitioning from mercury-containing to mercury-free products in the medical technology industry. One firm, American Diagnostic Corporation (ADC), is a manufacturer of diagnostic medical devices with operations in Hauppauge, New York, United States. The ADC study, which is more quantitative in nature, examines the company's experience with sphygmomanometers and digital thermometers. The other participating firm, Rayovac Hearing Aid Battery Division, is a manufacturer of miniature batteries for the hearing instrument market with plant operations in Portage, Wisconsin, USA and Washington, United Kingdom.

The Rayovac study is more qualitative in nature as a result of Rayovac's decision not to release specific financial information regarding the transition costs to mercury-free product manufacturing. In addition to the view into specific product sectors, the study illustrated two firms with distinct positions in a global supply chain. Rayovac's technology finds use within other manufacturer's products, while ADC represents branded product integration and testing immediately prior to end use. Despite the firms' occupancy of differing nodes along the supply chain, their experiences have led to similar decisions regarding transition to mercury free-products.

The manufacturers have demonstrated that they can provide mercury-free products with equivalent performance to the mercury-containing products for hearing aid batteries, thermometer batteries, and most sphygmomanometer applications. The results of the case studies suggest that the lack of a coherent, legally binding agreement for adoption of proven mercury-free alternatives has created a market place that requires manufacturers willing to invest in the development of mercury-free solutions to continue offering both mercury-containing and mercury–free devices. This scenario has delayed universal adoption of mercury-free devices and obligates firms to expend resources on less economically productive activity such as mercury management and production line changeovers while failing to capitalize fully on the economies of scale that could accrue from full conversion to mercury-free alternatives.

At this time, sufficient mercury-free manufacturing capacity exists within the product sectors examined in this study to assure supply of mercury-free products to meet consumer demand. In addition, a mandate to provide only mercury-free products in the sectors examined would foster competition among suppliers that will further promote innovation in mercury-free technologies to ultimately benefit consumers and the environment.

Introduction

Background

The United Nations Environment Programme (UNEP) Chemicals Branch works to protect humans and the environment from adverse effects caused by chemicals throughout their lifecycle, including hazardous waste. UNEP Chemicals' program reflects global priorities identified by governments around the world. In response to mandates from UNEP's Governing Council, UNEP facilitates global action, including the development of international policy frameworks, guidelines and programs, to reduce and/or eliminate risks from chemicals. Mercury is considered a chemical of global concern due to its long-range transport in the atmosphere, its persistence in the environment, its ability to bioaccumulate in ecosystems and its significant negative effect on human health and the environment. Mercury is known to produce a range of adverse human health effects, including damage to the nervous system, in particular the developing nervous system.

UNEP has been working to address issues associated with the use of mercury since 2003. During 2009, the Governing Council of UNEP agreed on the need to develop a global legally binding instrument on mercury. The work to prepare this instrument was undertaken by an intergovernmental negotiating committee supported by the Chemicals Branch of the UNEP Division of Technology, Industry and Economics as secretariat. The goal is to complete the negotiations before the twenty-seventh regular session of the Governing Council/Global Ministerial Environment Forum to be held in 2013. The third session of the Intergovernmental Negotiating Committee to prepare a global legally binding instrument on mercury is planned to take place at UNEP Headquarters in Nairobi, from 31 October to 4 November 2011 (UNEP, 2011). This study was commissioned in July 2011 by the UNEP Chemicals Branch to the Lowell Center for Sustainable Production (LCSP) with results aimed to inform the negotiations.

Objective

The objectives of this study were to accomplish the following:

- Investigate the cost of transition and technological shift in the manufacturing of mercury-containing to mercury-free product alternatives.
- Focus the investigation within the medical device technology sector.
- Involve two manufacturing firms from the North American and European geographic regions in the development of case studies representative of the medical device technology sector.
- Generalize the results obtained from the two firms to the broader market sector, and investigate options for financing the technology transition to mercury-free product alternatives.

Methodology

The intent of this study was to obtain primary data from two manufacturers that have made the transition from manufacturing and selling mercury-containing products, to manufacturing and selling mercury-free products. One firm should have manufacturing locations in the United States, and one firm should have manufacturing locations in Europe. The primary data would then be reviewed, analyzed and documented in a case study for each manufacturer. The type of primary data collected from the two manufacturers included the following:

a) Costs and challenges of transition to non-mercury alternatives
b) Economic elements: research and development costs, manufacturing costs, marketing costs, regulatory compliance costs and other costs saved or incurred during the technological shift
c) Payback period or Return on Investment (ROI)
d) Extrapolation to the entire product category sector
e) Financing options for transition costs

The first step was to identify manufacturers of devices in the medical technology sector that had manufactured mercury containing products and had partially or fully transitioned to manufacturing mercury-free products. Also, the manufacturing locations for these targeted firms should be in the North American and/or European geographic area. The LCSP identified thirty-two manufacturing firms that potentially met this requirement. This included fifteen firms with facilities in North America, and seventeen firms with facilities in Europe. The following is a listing of these companies:

North America

- MDF Instruments
- American Diagnostic Corp.
- GF Health Products Inc.
- W. A. Baum
- Welch Allyn
- Rayovac US
- Medline Industries, Inc.
- Sper Scientific Ltd.
- Taylor Precision Products
- Vee Gee Scientific
- Anderson Instrument Company
- BD Diagnostic Systems
- Miller & Weber, Inc
- Coto Relay
- GE Healthcare

Europe

- Rudolf Riester GmbH
- Brannan
- A C Cossor & Son
- Keeler LTD
- Heine Optotechnik
- Istar Solar
- Encapsulite
- Pickering Electronics
- Comus
- Siemens
- Philips Medical
- Varta
- Cegasa
- Leclanche
- Osram
- Celduc Relais
- Rayovac Europe

These thirty-two firms involved with manufacturing of mercury-containing and/or mercury-free medical technology devices were contacted via email and/or telephone to introduce the study objective and to solicit participation.

Firms that expressed interest in obtaining more information were provided with 1) the UNEP Introductory Letter and 2) the Case Study Information Request Form (see Appendix A). The purpose of the UNEP Introductory Letter was to emphasize the importance of this initiative and how UNEP would use the information provided by the manufacturer. The purpose of the Case Study Information Request Form was to educate the firm on the type of primary data that would need to be collected from them to support the development of the case studies. Many companies were non-responsive to these requests. Several companies were responsive, but upon learning more details about the case study requirements, declined to further participate. The most common objection to case study participation was the unwillingness of firms to provide confidential financial information that would be required for completing the case study.

Of the thirty-two North American and European firms contacted, the only two firms that were willing to participate and provide information for the case studies were: American Diagnostic Corporation (ADC) and Rayovac Hearing Aid Battery Division (Rayovac). ADC has a manufacturing location in Hauppauge, New York, United States, and Rayovac has manufacturing facilities in Portage, Wisconsin, United States and Washington, United Kingdom. The information for the case studies was obtained from these two firms in an iterative manner that included many phone conversations, email correspondence, document exchange, and on-site visits.

The on-site visits were conducted at the manufacturing facility locations and included interviews with key personnel and a review of the actual manufacturing processes. The site visit for ADC was conducted on September 7, 2011 with Quality Manager Michael Falco at the Hauppauge, New York, United States manufacturing facility. This facility manufactures both mercury-containing and mercury-free medical devices.

Two site visits were conducted for Rayovac. The first site visit was conducted on September 14, 2011 at the Portage, Wisconsin, United States manufacturing facility with Hearing Aid Battery Division Vice President Randy Raymond and Plant Manager Dave Young. The second site visit was conducted on September 27, 2011 at the Washington, United Kingdom plant with Hearing Aid Battery Division Vice President Vince Armitage, Plant Manager Glen Rutherford, Europe, Middle East and Africa (EMEA) Marketing Manager Paula Brinson Pyke, and by teleconference with David Reynolds of the battery recycling firm Battery Back.

The Portage, Wisconsin, United States facility primarily manufactures mercury free hearing aid batteries, and the Washington, United Kingdom facility primarily manufactures mercury-containing batteries. However, both manufacturing plants have the dual capability to manufacture mercury-free and mercury-containing hearing aid batteries. This is accomplished by conducting production line changeovers to meet the needs of their customers. Therefore, two site visits were required for Rayovac to fully understand the implications of transitioning from the manufacturing of mercury-containing to mercury-free batteries.

American Diagnostic Corporation (ADC)

American Diagnostic Corporation (ADC) was founded in 1984 and is considered one of the world's leading suppliers of diagnostic medical products, personal instruments, and accessories within the medical device industry. ADC is a privately held corporation with estimated annual revenues greater than 10 million USD (Manta, 2011).

ADC's corporate headquarters are located in Hauppauge, New York, United States. There are approximately 110 employees located at the Corporate Headquarters in Hauppauge NY. The headquarters occupies a 44,000 square foot office that includes quality control, sales, manufacturing, and distribution operations. ADC operates sales offices in London, England, and Tokyo, Japan to support European and Pacific Rim

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