

Eco-design implemented through a product-based environmental management system

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Abstract

Lucent Technologies (Lucent) has undergone considerable change in business strategy with the outsourcing of manufacturing activities. In order to control the significant environmental aspects of hardware products, Lucent's wireless business unit, Mobility Solutions, determined it would concentrate on the design of products: focusing on eco-design enables product sustainability to be improved, with each product generation providing a 'start of pipe' (front end) solution with attendant efficiencies.

Mobility Solutions pioneered a product-based environmental management system (PBEMS) to formally address the impacts of wireless hardware products on the environment throughout the entire product lifecycle, regardless of where products are developed. This management system looks beyond the environmental impacts of manufacturing to include conceptual design, development, use by the customer, and final product disposal.

The success of this approach can be attributed to the integration of eco-design with traditional hardware product realization processes. Through the PBEMS, business and environmental processes are simultaneously utilized to manage significant product aspects and to incorporate sustainability principles during product design. Many innovative eco-design tools are applied during the product realization process to identify areas for improvement of future products, and to verify that each generation of existing products is more sustainable than its predecessor. These eco-design tools include eco-roadmapping, design for environment guidelines and checklists, and lifecycle assessments.

The Mobility Solutions PBEMS conforms to the requirements of the ISO 14001 international standard and has achieved third-party certification. By implementing environmentally responsible characteristics through eco-design programs, employees, customers, and the world community benefit from a consistent approach to the environmental management of wireless hardware products. Mobility Solutions continues to reap the value of sustainable product design that is both good for the environment and makes sound business sense.

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1. Introduction

Lucent Technologies is a recognized world leader in the design and delivery of the systems, services and software that drives next-generation communication networks. Backed by

Bell Laboratories' research and development and its wireless business group, Mobility Solutions, Lucent uses its strengths in mobility, optical, software, data and voice networking technologies, as well as services, to create new revenue-generating opportunities for its customers, while enabling them to quickly deploy and better manage their networks. Lucent's customer base includes communications' service providers, governments and enterprises worldwide. Lucent maintains a global presence that includes 31,500 employees worldwide.

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Lucent is committed to protecting the environment and the health and safety of its employees, customers, and the communities where they operate. This commitment is demonstrated through an ISO 14001 [1] product-based environmental management system (PBEMS). The Mobility Solutions Green Team pioneered the innovative approach of using a management system to integrate eco-design principles into the business culture. Through the system the design community is engaged in lifecycle thinking encouraging innovation to ensure that succeeding generations of products are designed to enable wiser, sustainable use of natural resources.

Through the PBEMS, eco-design principles are applied to strategic business decisions, product evolution planning, and product development. This approach positions Mobility Solutions to meet the rise in stringent legal and customer product-based environmental requirements and the increasing public concern over the impacts electronic equipment has on the environment. For example, the European Union (EU) has enacted a directive known as RoHS [2], Restrictions on Hazardous Substances, banning specified hazardous materials as constituents of specified electronic equipment.

In this paper, we will discuss how the elements of ISO 14001 [1] are applied through the PBEMS to manage hardware product environmental impacts and to improve product environmental performance through eco-design. In addition to touching upon those elements of ISO 14001 [1] that support the PBEMS in a more traditional manner, we will discuss in detail those elements that have a direct impact on eco-design. We will describe how the formal structure of the PBEMS is facilitating the management of an internal initiative to meet the RoHS [2] material substance ban. We will also discuss the benefits and advantages of implementing a PBEMS, the challenges faced during development and implementation, and the lessons learned.

In the next section we will discuss how the application of ISO 14001 [1] requirements for conformance to detailed procedural and documentation requirements, a commitment to continual improvement, compliance with applicable laws and regulations, and a focus on the prevention of pollution have been successfully integrated with product realization processes to facilitate eco-design.

2. PBEMS elements

2.1. General requirements

The PBEMS is designed to be an ongoing, dynamic environmental outgrowth of the “Plan,” “Do,” “Check,” “Review,” quality process and supports the traditional management system model.

The PBEMS is structured to enable Mobility Solutions to:

- (1) establish and maintain a product-based environmental policy appropriate to hardware design activities,
- (2) identify significant environmental aspects arising from hardware products,

- (3) identify applicable legal and other environmental requirements, including customer requirements,
- (4) identify priorities and set product-based environmental improvement objectives and targets,
- (5) establish an eco-design program to implement the product-based environmental policy and to achieve objectives and targets,
- (6) facilitate planning, control, monitoring, corrective action and auditing activities to ensure the policy is implemented and that the PBEMS remains appropriate, and
- (7) conduct management reviews on the effectiveness of the PBEMS.

The scope of the PBEMS covers the design and development of wireless hardware products. All Lucent employees who support product realization are included within the scope regardless of organizational reporting structure or geographic location.

Employees included within the scope of the PBEMS are tenants in facilities with existing environment, health and safety (EH&S) management programs which pertain specifically to facility activities and impacts. Tenants are covered by those existing facility environmental management programs. This PBEMS does not include or impact those facility-related EH&S programs.

The PBEMS is integrated within key business strategies and processes (Product Planning, Product Development and Product Deployment Management) to provide a management structure that addresses the immediate and long-term environmental impact of Mobility Solutions hardware products.

Mobility Solutions has chosen to integrate the PBEMS with the business quality management system (QMS) as a general requirement of the PBEMS. The business QMS is certified to the TL 9000 standard [3]. TL 9000 [3] defines the telecommunications' quality management system requirements for the design, development, production, delivery, installation, and maintenance of products. Both ISO 14001 [1] and TL 9000 [3] require several procedures that are virtually identical. Integration of the PBEMS with QMS procedures fulfills ISO 14001 [1] requirements, eliminates redundancy and ensures consistency. Integration with TL 9000 [3] elements is discussed throughout this section.

2.2. Policy and management commitment

The Mobility Solutions product-based environmental policy is the driver for implementation and improvement in the PBEMS so that Mobility Solutions may continually improve upon the environmental performance of wireless products. The environmental policy demonstrates top management commitment to compliance with applicable environmental regulations, adherence to Lucent requirements and the process of continual improvement in both its PBEMS and in the environmental performance of its products. The policy also forms the framework for establishing and reviewing Mobility Solutions product-based environmental objectives and targets. The intent

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