

Circular economy concept for power cables

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ABSTRACT

The 'Circular Economy' is a generic term for an industrial economy that is, by design or intention, restorative and in which two material types flows, biological nutrients, designed to re-enter the biosphere safely, and technical nutrients, designed to circulate at high quality without entering the biosphere. Ideally, no new raw materials are needed as the product life cycle is a closed circle. The term encompasses more than the sustainable production and consumption of goods and services. It includes discussion about the roles of money and finance as part of the wider debate; which is marked as 'TCU': Total Costs of Usage.

KEYWORDS

Circular economy, sustainable development, life cycle design strategy, closed-loop cycles, chain efficiency, TCU, P-Laser technology, CO2 reduction.

INTRODUCTION

Alliander interpreted, within its organization, the 'Circular Economy' approach as follow: **Life cycle**, **value** and **reusability** of materials are maximized, where **waste** and **energy use** is minimized. This is done by:

- Purchasing materials focusing on reusability and high quality recycling.
- Optimizing maintenance scheme and maximizing life span and cycle of materials.
- Recovering end-of-life materials.

DNO Alliander foresees shortages of raw materials for electrical equipment for power distribution for the coming years and believes that the circular economy model will cope with this. For this, Alliander searches for partners and suppliers that are willing to integrate the circular economy model in the design, production, transport, usage and re-use of the supplied components and systems. Alliander's **main target** is to be the first DNO in the world with 40% (in weight) of the purchased goods to be marked as part of the circular economy model by 2020. Therefore, Alliander looked at several grid components and in this context, (power) cables are one of the main components. In 2014 Alliander initiated dialogue sessions with its major cable providers, including Prysmian.

Prysmian Group supplies LV, MV and HV extruded power cables to Alliander and has already introduced a number of inventions which supports the circular economy model such as:

- Replacing the triple layer XLPE insulation and screens with the thermoplastic **P-laser** concept: not only reducing the carbon footprint during cable production, but also facilitating the re-use of the insulation material,
- Finding alternative solutions for the copper wires screen such as CCA or aluminum wires

- Usage of black sheath with only a red outer stripe for easier recycling instead of the present homogenous red colored outer sheaths

The impact of these modifications will be analyzed with dedicated LCA software. As a forefront company, the Prysmian Group favors the circular economy model and supports Alliander for further exploration of possible upgrading of the cable itself but also look at the logistic concept (re-design of reels, upgrading logistic performance), support on easy jointing of cables (reduction man-independence) and develop more effective recycling techniques.

FROM LINEAR TO CIRCULAR

When we look at the traditional way of designing and manufacturing of power cables we see mainly a linear system as illustrated by the schematic view in figure 1. In general, metals have very high recycling rate, where plastic components are far more difficult to recycle or reuse in the same type of cables in a cost efficient way.

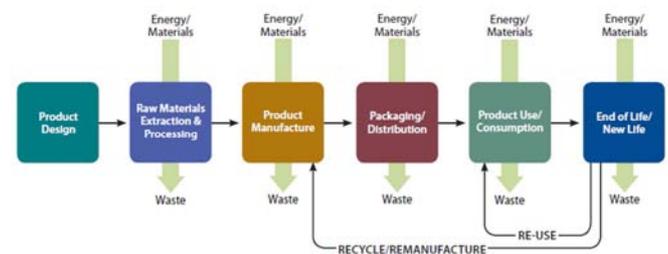


Fig. 1: Linear product life cycle

In the cable industry there have been over the years a constant drive to increase the use of recyclable materials during production and materials coming from scrap or the end-of-life stage. However the decisions made at the design stage of a cable can have very crucial impact on the sustainable performances of the product. A more ideal system for the product life cycle is represented in figure 2.

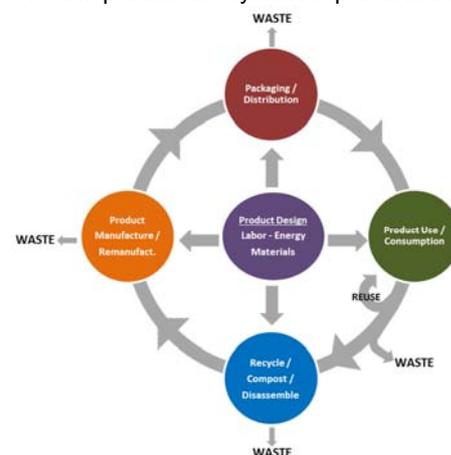


Fig. 2: Circular product life cycle