SPECIAL POSTER SESSION
IPSS2017

Product Service Systems or Recycling for material efficiency?

Research problem & objectives

In a business-to-business PSS or producer responsibility program, ideally residual product material is returned via reversed material flow to the original supplier. The benefits are (1) no downgrading, (2) assurance of material quality, (3) bilateral relation between the supplier and the user. A typical example can be given in e.g. aero industry with expensive materials castings, where return of metal scraps and swarf to the casting company often are included in contracts. This is a possibility for a PSS with incentives to raise casting quality, reduce waste and secure raw material supply. A problem with this solution is that the system complexity and logistic effort rises when there are many small flows of different materials to several suppliers.

The traditional recycling manner, however, is to send wasted material via a recycling entrepreneur who will further bring the wasted materials to the recycling market (typically to the user with highest rate of payment per separation effort). For many materials with several users and suppliers the use of a recycler as material broker may be the most economically efficient system. However, small flows of material mixed into the larger standardized streams will contaminate the streams and ultimately widen the specs of the recycled material and thus be a source of downgrading.

Research questions

- When should material be supplied in a Product Service System (PSS) with a takeback system (PSS recycling) versus when should material be sold regularly and returned by traditional recycling entrepreneurs with standardized recycling material grades (fig. 1)?
- What number of different suppliers can the PSS scenario handle without becoming too complex and with flows too small to be efficient? On the other hand, what system parameters affects the material mix in traditional recycling to result in severe downgrading?

Research methodology

Two case studies in the Swedish vehicle industry is used to illustrate the Product Service Systems (PPS) logistic dilemma. One case where steel sheet coils are used in vehicle manufacturing (fig. 2). Residual material is recycled either by returning it to the steel sheet provider or by a recycling company putting it back on the market. The second case considers plastic packaging used by component suppliers (fig. 3), the packaging material can be recycled/reused either by sending it back through the supply chain for reuse or recycling, or by a recycling company.

Literature and theoretical logistic and business models is compared to the existing options from the two case studies. Cost simulations of options, and interviews regarding managerial preferences of key personnel will form the main empirical foundation. Policy implication of the different options are studied.

In the Circular Models for Mixed and Multi material Recycling in manufacturing (CiMMRec) project, the material efficiency first consider how much material is used as product or is recycled, but secondly, also how the quality of the material or value of the material is retained in the loops.

Expected results

The CiMMRec project aims to provide guidelines for recycling loops, material efficiency and minimization of material downgrading in manufacturing industry. The challenge with the PSS model is that material needs to be returned to the original producer not to the closest user of recycled material or the highest bidder. The logistics need to be specified for each supplier, sometimes with small flows. The information control for an industrial user with many supplied materials will be large. The challenge for recycling industry is to guarantee high material quality while keeping economical efficient logistics and separation.

A guideline with different managerial options on how to steer the material flows will be provided. By clarifying different logistic options some different typological examples of recycling logistics and recycling management will be formed.

Academic & industrial contribution

The material efficiency of production systems becomes increasingly important for both economical and environmental reasons. This research contributes to the area of material efficiency and PSS by increasing understanding of the residuals flow and their recycling loops. This helps to keep the original value of material, to avoid downgrading and to provide economically and environmentally benefits for manufacturing companies and material suppliers.

Important contribution to the research is funded by Mistra Closing the loop II and by XPRES.

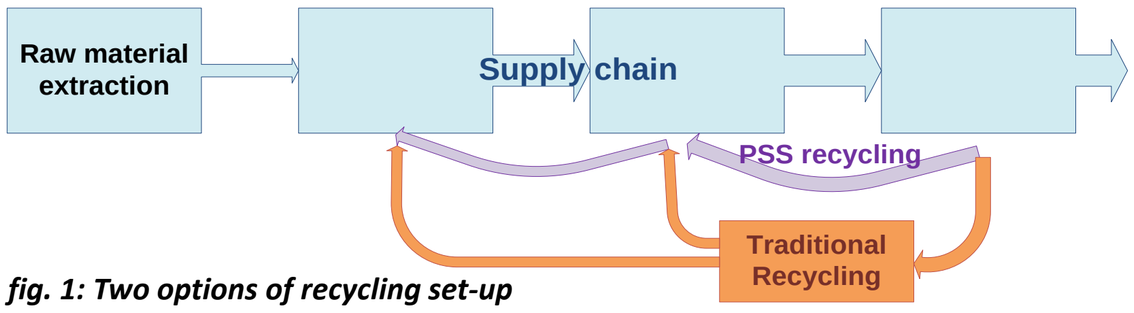

fig. 1: Two options of recycling set-up

fig. 2: Steel coils

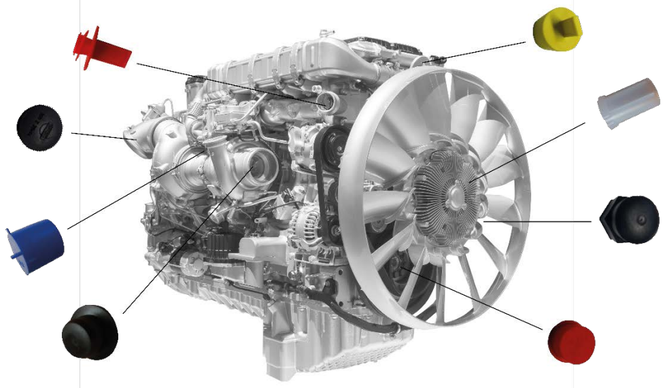

fig. 3: Plastic packaging materials

iPSS 2017 Copenhagen — Circular Perspectives on PSS

Collaborating partners: Volvo, Mälardalens Högskola Eskilstuna Västerås, Scania, Lunds Universitet, RI.SE, Stena Recycling, Kinnarps Tapet och Logistik, Plastal, almedahls, Miljögiraff

Co-funded by: XPRES Initiative for excellence in production research

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