Master thesis within supply chain management with a special focus on the Swedish automotive recycling industry

Chalmers IndustriTeknik (CIT) is a foundation originated by Chalmers University of Technology with an annual turnover of 104 million SEK and approximately 100 employees. CIT intends to in a commercialized manner sell services for support in industrial development processes, which have been tested and guaranteed for their high level of knowledge.

The business area “Återvinning och hållbar materialåtervinning” helps industry and society to develop sustainable solutions intended to minimize the generation of waste, create values and resources from waste products, design and construct more resource efficient products, comply with legislation and regulation, as well as contribute to knowledge in the field. The group consists of seven employees with competence in circular economics, logistics and transportation, material technology and nanotechnology.

Background
Explore is a multidisciplinary research project funded by Mistra (http://www.mistra.org) with the aim of strengthening the Swedish automotive recycling industry’s role in a more circular economy and create close cooperation between manufacturing and recycling industries. CIT is responsible for analyse and propose solutions for efficient reverse logistics of plastic parts from dismantling of scrapped cars, in order to achieve higher recycling rates.

The reasons to why plastic parts are in focus is that cars increasingly are made up by plastic and plastic recycling is of great importance for the industry to achieve the EU recycling targets for end-of-life cars (ELV). The goal is that the recovery rate for ELV will reach at least 95% of the car's weight, of which at least 85% by weight will be for reuse or material recycling. Today, largely no plastic is recycled from ELV. Typically, the plastic parts follow the body and end up in the recycling companies' large fragmentation plants where they are crushed and become a so-called “fluff fraction” that goes to energy recovery and to some extent landfill. A higher recycling rate could be achieved if the dismantler picked up the plastic parts before the fragmentation.

The main reasons for the low recycling rates is the current payment models between dismantlers and recycling companies, low value of virgin plastic raw materials, as well as the costs associated with dismantling, sorting and transportation. As an example, bumpers can be specified. To access valuable spare parts, the bumper is removed by the dismantler. This plastic part is a so-called polypropylene (PP) that recyclers are interested in. The problem is that the bumpers in their current form absorb large volumes that cause low fill rates. High transport costs and relatively low value results in a loss affair for the dismantler to send bumpers to a recycling company. The fact that the dismantler is paid by weight for the body is yet a reason to put the bumper back together with the body for transport to the fragmentation.

Purpose
The purpose of the thesis is to assist the project in developing cost-effective solutions that make it economically justified to dismantle plastic parts for recycling. We already have the knowledge about which plastic parts that are of importance from an environmental and an economic perspective. Based on this knowledge, the following questions are of interest within the project:

• **Business model:** Who is the customer and what does the customer requirements look like? What does Swedish recycling companies require in terms of quantity and quality etc. and how much is the dismantler paid? Is it possible for a dismantler to sell directly to the companies that recycle the plastic? Where are plastic recyclers located, how does their requirements look like and what do they
pay? Is it possible to sell directly to plastic manufacturers and, if so, what does it require in terms of quality, quantity, shape, characteristic, knowledge, etc.? What do they pay?

• **Efficient transport:** What are the options for reducing the size of the plastic parts (compress, grind, tear etc.) for higher filling rates in the trucks. What are the pros and cons of the different options? Is it possible to rent equipment or must a dismantler purchase the equipment, pros and cons?

• **Logistics chain:** What are the options for increase the volumes of the plastic parts that are disassembled for recycling (coordinate flows from different dismantlers, coordinate flows from recycling with other plastic flows, etc.), advantages and disadvantages of the different options?

**Methods**
Apart from CIT, the project also includes the Swedish Environment Institute (IVL), Walters Bildelar AB, Eklunds Bildelslager AB and Stena Recycling. You will work close to the people who are connected to the project. Methods that will be applied are interviews, observations, practical tests and probably some simulation.

**Your profile**
We are looking for students at the civil engineering or MBA program with relevant focus in production logistics, transport logistics, economics and marketing. The length of the examination work sets the framework for the schedule. For questions regarding the thesis work, contact Linea Kjellsdotter Ivert 0708 782144 or linea.kjellsdotter@cit.chalmers.se.