Projekt i Beräkningsteknik, 15 HP

Background
Steel plates are one of the most common types of steel elements produced in the world. During the last two decades the yield strength of the hardest steel grades has had an extraordinary improvement. Materials with yield strength of 1.5 [GPa] and higher, are now commonly used, especially in automotive industry.

Steel plates are formed by cutting, welding, and rolling etc. into desirable forms. Almost all of these steps require some form of cutting process. The hardness of the materials has made the cutting process more susceptible to defects both for material itself and the cutting equipment. These defects often lead to unnecessary fatigue failure of manufactured parts. On the other hand the extraordinary hardness of the materials results in shorter life span of the cutting equipment. To address these problems an initiative has been taken by Jernkontoret to help the metal industry to bring this problem into focus.

Aim of the study
The main purpose of this study is to approach the problem from the plate material point of view. Which mechanical processes is the plate going through? The main focus of this study is to simulate the slitting process, which is a continuous shearing process in a slitting line.

Numerical simulation
A simulation model will be implemented in IMPETUS Afea Solver, a Finite Element Software provided by IMPETUS Afea. The numerical simulations and a subsequent experimental study of the cut edges will serve as a basis for how to optimize the process, with the goal to reduce the induced defects on the cut edges. This project will mostly focus on the numerical simulation model itself, namely the implementation, efficiency, mesh refinement, and hypothesis about relevant physical mechanisms in the slit- and shear processes.

Supervisor
Lars Olovsson, CEO at IMPETUS Afea Solver