Sensitivity of optimal solutions for hot rolling with MATLAB

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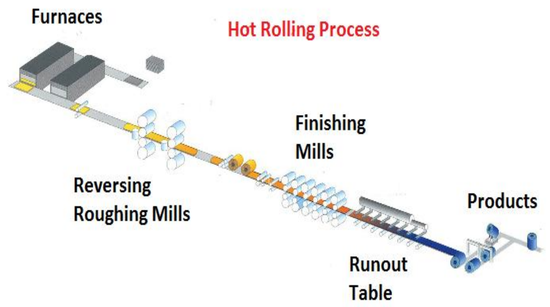
What is hot rolling process?
It is a process that creates individual parts, assemblies, or large-scale structures by putting metal, which is heated up to a very high degree in temperature, into several specific rolling mills.



Aim: Since the process is expensive, mathematical models are created to reduce the cost. These mathematical models are already implemented in the software MATLAB and only the constraints, which are the boundaries of a feasible set if it is possible, are edited to see the effect of these constraints on the optimal solutions.

Methods: First, a set of initial points that gives feasible and good solutions are generated and fixed. Then, the sensitivity of the optimal solutions are analyzed by expanding the feasible set by 1% and using the set of initial points.

Conclusion: Certain constraints have effect on the solution whereas many do not and when the nonlinear equalities constraints become a pair of nonlinear inequalities, these all new inequalities also have effect in the minimum point, which shows the importance of the limitations of the nonlinear equality constraints.

Results: The sensitivity result for different constraints: