Technische Hochschule Rosenheim

Bachelor's Thesis Announcement

Rare Earth Exposure in Multi-Tier Supply Chains: Risk Analysis and Mitigation Scenarios for a Manufacturing Company

Faculty:
Faculty of Industrial Engineering,
Technische Hochschule Rosenheim

Start:
Immediately or by arrangement

1. Background and Task Description

Rare earth elements and permanent magnets are essential for electric motors, actuators, sensors and many other industrial components. China accounts for around 85 to 90% of global rare earth processing and separation capacity. Since April 2025, several medium and heavy rare earth elements such as dysprosium and terbium, as well as magnets, have been subject to Chinese export licensing. Further, more far-reaching export controls were suspended until 10 November 2026; their possible reactivation creates considerable uncertainty for European industry.

According to an estimate by the European Central Bank, more than 80% of large companies in the euro area are no more than three tiers away from a Chinese rare earth producer. Many companies, however, do not know their own exposure, because the dependency lies several tiers deep in the supply chain and is not visible in the bill of materials or in direct supplier relationships.

2. Objective

The aim of this thesis is to analyse the dependency of a manufacturing company on rare earths and permanent magnets across its multi-tier supply chain, to assess the resulting risk in different scenarios and to evaluate suitable mitigation measures.

3. Tasks

1. Fundamentals: Overview of supply chain risk management methods and of the current situation on the rare earth market, including export controls and price developments.
2. Selection and scope: Definition of the product families and components to be examined together with the partner company (e.g. electric motors, actuators, sensors).
3. Exposure analysis: Analysis of bills of materials and supplier data, and mapping of the supply chain over two to three tiers by means of a supplier survey.
4. Risk assessment: Evaluation of the identified dependencies using established criteria such as probability, impact, time-to-recover and availability of alternatives.
5. Scenario analysis: Development of three scenarios (e.g. extension of the suspension, partial controls, full reactivation) and assessment of their impact on the company.
6. Mitigation measures: Evaluation of options such as second sourcing, safety stocks, product redesign (e.g. magnet-free motor concepts) and recycling or take-back of magnets, followed by a prioritised action plan.

4. Expected Results

A transparent picture of the company's rare earth exposure across several supply chain tiers, a documented risk assessment, three evaluated scenarios and a prioritised action plan with concrete

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mitigation measures.

5. Your Profile

You are enrolled in a bachelor's programme in industrial engineering, business administration, logistics or a related field. You are interested in supply chain management, procurement and risk management. Good analytical skills and confident use of Excel are required; knowledge of ERP systems is an advantage. You work independently and in a structured way, and you enjoy working closely with a company on a current, practice-oriented question. The thesis is intended to be carried out in cooperation with an industry partner; your own suggestions are welcome.

6. Language

The thesis can be written in English or German.

7. Contact

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