



Railway Evening 2025

Master Thesis Proposals

Life Cycle Analysis of rare earth free PM motors for railway traction

Alstom Västerås / RSC Drives - 2025_DRIVES_H201

Background

Alstom is collaborating with Uppsala University on a new permanent magnet railway traction motor design concept without rare earth metals. It is therefore important to understand the full environmental impact of such a design compared to conventional designs.

Condition monitoring and fault detection by GDU based smart sensor functions

Alstom Västerås / Traction Systems _202509_TRACTION_H205

Background Alstom's new traction platform is designed to deliver high performance and energy density. This is accomplished by the effective utilization of the latest generation of power semiconductor devices (Si / SiC) in a new standardized and scalable packaging for railway traction. Alstom's state of the art Gate Drive Unit (GDU) - technology is developed for controlling the semiconductor modules optimally based on different operating conditions. The GDU FPGA is integrated with advanced sensing capabilities which can not only sense base parameters like voltage, current, temperature but can also incorporate new features for condition monitoring and fault detection.

Characterization of inductors for sound prediction on trains

Alstom Västerås / RSC Traction Design 202509_TRACTION_H204

Background Alstom has identified a need to improve the sound environment on trains by predicting the sound from inductors and transformers in converters. It has proven difficult to obtain useful results through the simulation of electromagnetism - structure and airborne sound. Therefore, a thesis is proposed to characterize inductors and find significant common denominators that affect sound radiation.

Compact digital twin health monitoring function for edge computing in railway traction controller

Alstom Västerås / RSC Traction Design - 202509_TRACTION_H202

Background Alstom's latest traction platform is based on high performance converters operated with advanced control methods in Alstom's indigenous control platform. The control platform uses several sophisticated control algorithms that require high fidelity real time monitoring while limiting the need for discrete hardware sensors.

KTH Railway Thesis



AI readiness for rail freight traffic

Green Cargo AB

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☒ 2 Tech, Signaling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

Artificial Intelligence (AI) has become a key enabler for innovation across industries, supporting for instance improved decision-making and operational efficiency. In the railway sector, AI has the potential to optimize logistics, enhance safety, increase punctuality, and reduce environmental impact. For Green Cargo, Sweden's leading rail freight company, AI could support more efficient capacity planning, maintenance scheduling, energy optimization, and customer service improvements. However, successful AI adoption depends not only on the availability of data and technology but also on organizational preparedness in terms of infrastructure, processes, and human competence. Assessing AI readiness is therefore a crucial step to ensure that investments in AI deliver tangible value.

Green Cargo is Sweden's most experienced operator in rail logistics with roots in the origins of Swedish rail traffic. We deliver sustainable logistics solutions and are an important part of Scandinavia's trade and industry. Over 98 percent of our transport operations are powered by fossil-free electricity. Every weekday, we run 350 freight trains and replace around 9,000 truck transports on the road network. In our network, we serve nearly 200 locations in Scandinavia, and with partners we reach the whole of Europe. We have 1,750 employees, transport approximately 20 million tonnes of goods and have an annual turnover of SEK 4.2 billion (2024).

Problem Description

Although AI opportunities in rail freight are quite clear, many organizations face challenges in evaluating how ready they are to adopt and scale AI solutions. Readiness involves factors such as data quality, IT infrastructure, organizational culture, competence, and governance. Without a structured assessment of AI readiness, Green Cargo risks missed opportunities, inefficient allocation of resources, or failed projects. Another challenge is methodological: Which methods can or should be used to evaluate AI readiness in a way that is systematic and repeatable? The focus is not on developing AI models, but on establishing processes and methods that can ensure the right preconditions for AI work. There is currently limited research on structured, repeatable

approaches to AI readiness in railway freight companies, creating a gap in both practice and knowledge.

Task

The project will assess AI readiness in one selected department within Green Cargo by identifying critical factors, analyzing their current state, and proposing improvement areas. Possible tasks include:

1. Review existing AI readiness frameworks and methods, with focus on approaches that ensure repeatability and process-orientation.
2. Adapt or design a methodology suitable for rail freight operations that goes beyond one-off evaluations and can serve as the basis for a readiness process.
3. Collect and analyze information through interviews, surveys, and documentation from the chosen department.
4. Apply the methodology to evaluate the department's AI readiness and highlight strengths and weaknesses.
5. Provide recommendations for improving AI preparedness and for establishing a process that enables repeated assessments over time.

Goals

- **Primary Goal:** To provide Green Cargo with an evidence-based evaluation of AI readiness in one of its departments, including methods for making readiness assessments systematic and repeatable.
- **Sub-goals:**
 - Review and compare methods for assessing AI readiness.
 - Adapt or propose a framework tailored to the rail freight sector.
 - Demonstrate the application of the method within the selected department.
 - Deliver recommendations for both short-term improvements and long-term process establishment.
 - Contribute to academic and practical understanding of how AI readiness can be ensured in a repeatable, process-oriented way.

Type of degree project (can be both)

☒ Master (20 weeks)

☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

☒ Swedish and/or ☒ English

Is Swedish a language requirement?

☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

☒ Yes ☐ No

Contact person

Name: Tim Janke

Role: Enterprise architect

Email: tim.janke@greencargo.com

Business Case for Optimal Wheel Profile Detector Stations

Green Cargo AB

Select one (or more) categories to which this degree project corresponds the best

- | | |
|--|---|
| ☐ Traffic Planning, market and Simulation | ☐ Electrical engineering and Power supply |
| ☐ Signalling and Traffic control systems | ☒ Digitalization, AI and Data Analytics |
| ☐ Vehicles for Rail and Public transport | ☒ Business Management |
| ☐ Rail track, Geotechnics and Constructions | ☐ Sustainability and Environment |
| ☐ Properties and Land use | ☐ Other |

Background

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Today, there exists detector solutions which can be mounted on rail infrastructure to conduct scanning of wheel profiles to derive measurements. Green Cargo believe that such stations and wheel profile measurements could be beneficial for more efficient maintenance planning.

Problem description, tasks, and goals

The task and goal are to research and determine whether Green Cargo should invest in detector stations and conduct scanning of wheel profiles for more efficient maintenance planning. Green Cargo also wants to have determined which detector solutions that are suitable and where they should be placed geographically for optimal business value and maintenance optimization.

A dialogue between Green Cargo and the master thesis students will later be held to determine the exact scope and needed delimitations for the degree project to benefit both Green Cargo and academy.

Green Cargo is looking for student(s) who has conducted related studies, e.g. in Mechanical Engineering or similar.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☒ English

Is Swedish a language requirement?

- ☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Carl Bergstrand

Role: Verksamhetsutvecklare

Email: carl.bergstrand@greencargo.com

Employee Suggestion Program (förslagsverksamhet)

Green Cargo

Select one (or more) categories to which this degree project corresponds the best

- | | |
|--|--|
| ☐ Traffic Planning, market and Simulation | ☐ Electrical engineering and Power supply |
| ☐ Signalling and Traffic control systems | ☐ Digitalization, AI and Data Analytics |
| ☐ Vehicles for Rail and Public transport | ☒ Business Management |
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Green Cargo wants to design and implement the optimal employee suggestion program (Swedish: *förslagsverksamhet*) to encourage ideas for continuous improvements and systematically manage these ideas—from evaluation to implementation—to maximize continuous improvements related to products, services, processes, assets, safety, workplace culture, and more.

Problem description, tasks, and goals

The task is to design and recommend the optimal employee suggestion program (with related processes) tailored to Green Cargo's organizational context and needs. This includes researching the current state and how Green Cargo should encourage and manage the inflow, evaluation, implementation, and recognition of employee ideas to maximize the value from continuous improvements and strengthen employee engagement and culture. The design and recommendations should be data-driven, where data should be obtained by studying best practices and collecting data from the company and its employees'. The goal is to design and recommended such an employee suggestion program for Green Cargo to later implement.

A dialogue between Green Cargo and the master thesis students will later be held to determine the exact scope and needed delimitations for the degree project to benefit both Green Cargo and academy.

Green Cargo is looking for student(s), e.g. in Industrial Engineering & Management, who has conducted related studies in Quality Management (kvalitetsutveckling), Production Development, Lean Manufacturing, or similar. Both spoken and written Swedish are required for this degree project.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☒ English

Is Swedish a language requirement?

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Possibility to work from our office

☒ Yes ☐ No

Contact person

Name: Carl Bergstrand Role: Verksamhetsutvecklare

Email: carl.bergstrand@greencargo.com

Modelling and Forecasting of Block Brake Wear

Green Cargo AB

Select one (or more) categories to which this degree project corresponds the best

- | | |
|--|---|
| ☐ Traffic Planning, market and Simulation | ☐ Electrical engineering and Power supply |
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In our mission for more condition-based maintenance (CBM), we've identified a key area of improvement, the brake material. Today, brake blocks and pads must be inspected at regular intervals, a process that is both time-consuming and costly. By developing a wear model of the brake material, it becomes possible to inform maintenance personnel more accurately about which wagons are due for replacement, reducing unnecessary inspections and optimizing maintenance planning.

Problem description, tasks, and goals

The project aims to model and forecast brake block wear for locomotives and wagons. The model will draw on data from the on-board locomotive computer—such as main pipe pressure and locomotive speed—to estimate braking forces. These forces will then be correlated with wear rates using a combination of operational data, real-world measurements, and maintenance records. The expected outcome is a data-driven model that can forecast brake material wear and support CBM strategies.

The project is suited for M.Sc. students in Railway Engineering, Vehicle Engineering, Applied Mathematics, Machine Learning, Computer Science, or related disciplines.

Applicants should have prior experience with Python or Matlab, and an interest in data analysis, modelling, and applied research in railway systems.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☒ English

Is Swedish a language requirement?

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Possibility to work from our office

☒ Yes ☐ No

Contact person

Mattias Wang
mattias.wang@greencargo.com

Maintenance Engineer

Modelling of Rolling Contact Fatigue on Wheelsets

Green Cargo AB

Select one (or more) categories to which this degree project corresponds the best

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|--|---|
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The Swedish Transport Administration (Trafikverket) has installed wheel damage detectors along multiple track segments to identify out-of-round railway wheels and thereby reduce infrastructure damage. A force limit of 350 kN has been established, and exceeding this threshold results in significant costs for the operating company. Over the lifecycle of a wheelset, cyclic forces in the wheel–rail interface give rise to rolling contact fatigue (RCF) (Swedish: krosskador). This damage will increase the forces experienced in the wheel–rail interface.

Problem description, tasks, and goals

The objective of this project is to model the progression of rolling contact fatigue in railway wheels. By accurately describing and forecasting the development of such damage, it becomes possible to optimize wheelset utilization—maximizing service life while minimizing the risk of surpassing the 350 kN limit. The expected outcome is a data-driven decision support tool for maintenance planning and cost reduction.

The project is suited for M.Sc. students in Railway Engineering, Vehicle Engineering, Applied Mathematics, Machine Learning, Computer Science, or related disciplines.

Applicants should have prior experience with Python or Matlab, and an interest in data analysis, modelling, and applied research in railway systems.

Type of degree project (can be both)

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Possibility to work from our office

☒ Yes ☐ No

Contact person

Mattias Wang
mattias.wang@greencargo.com

Maintenance Engineer

Optimising Infrared Heat Detection for Braking and Bearing Fault Identification in Railway Vehicles

Green Cargo AB

Select one (or more) categories to which this degree project corresponds the best

- | | |
|--|---|
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The Swedish Transport Administration (Trafikverket) has installed infrared heat detectors along several track segments to measure the temperature of wheel running surfaces and bearings. These detectors are primarily used to identify cases of unintentional braking (tjuvbroms) and bearing failures.

Problem description, tasks, and goals

The project is structured into three main parts. First, to assess the accuracy of the detectors and the quality of the recorded data. Second, to analyse and identify situations that result in false positives and, in particular, false negatives, and to provide recommendations for improved alarm thresholds. Third, to propose suitable locations for future detector installations in order to enhance reliability and reduce the risk of heat-related failures.

The project is suited for M.Sc. students in Railway Engineering, Vehicle Engineering, Applied Mathematics, Machine Learning, Computer Science, or related disciplines.

Applicants should have prior experience with Python or Matlab, and an interest in data analysis, modelling, and applied research in railway systems.

Type of degree project (can be both)

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Possibility to work from our office

☒ Yes ☐ No

Contact person

Mattias Wang
mattias.wang@greencargo.com

Maintenance Engineer

Organization to Manage Predictive Maintenance Output

Green Cargo AB

Select one (or more) categories to which this degree project corresponds the best

- | | |
|--|--|
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Green Cargo wants to research the optimal way to organizationally manage output from a potential predictive maintenance-system.

Problem description, tasks, and goals

The task is to research and answer: if Green Cargo utilizes predictive maintenance which then generates outputs that requires action in terms of maintenance efforts, how should it be managed in Green Cargos maintenance system and overall maintenance regime? How should Green Cargo manage the alerts we receive? How should the output be translated into practice?

Green Cargo is looking for student(s) who has conducted related studies, e.g. in Business Management, Quality Management (kvalitetsutveckling), Lean Manufacturing, or similar. Both spoken and written Swedish are required for this degree project.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Högskoleingenjör (10 weeks)

Language for the thesis

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Is Swedish a language requirement?

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Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Carl Bergstrand Role: Verksamhetsutvecklare

Email: carl.bergstrand@greencargo.com

Value Stream Mapping of Maintenance Depots with Recommendations for Improved Effectiveness

Green Cargo AB

Select one (or more) categories to which this degree project corresponds the best

- | | |
|--|--|
| ☐ Traffic Planning, market and Simulation | ☐ Electrical engineering and Power supply |
| ☐ Signalling and Traffic control systems | ☐ Digitalization, AI and Data Analytics |
| ☐ Vehicles for Rail and Public transport | ☒ Business Management |
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Green Cargo has three maintenance depots in Eskilstuna: one for electric locomotives, one for diesel locomotives, and one for wagons. Green Cargo wants to research if efficiency can be improved at these maintenance depots, e.g. by decreasing lead time, waste and non-value-added time, etc. in line with Lean manufacturing and other related best practices.

Problem description, tasks, and goals

The task is to conduct value stream mappings of the maintenance depots and research if and how efficiency can be improved. This includes mapping the current state; identifying value and non-value-added time, bottlenecks, etc.; and mapping an optimal state. This should be done by collecting qualitative and quantitative data at the maintenance depots, as well as other needed data. The goal is to present value stream mappings of the three maintenance depots with conclusions and recommendations for any improvements.

A dialogue between Green Cargo and the master thesis students will later be held to determine the exact scope and needed delimitations for the degree project to benefit both Green Cargo and academy.

Green Cargo is looking for student(s), e.g. in Industrial Engineering & Management, Production Development, or Mechanical Engineering with a production focus, who has conducted related studies in Production Development, Manufacturing Systems, Lean Manufacturing, or similar. Both spoken and written Swedish are required for this degree project. Physical data collection at the maintenance depots in Eskilstuna is required to derive data-driven conclusions and recommendations.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☒ English

Is Swedish a language requirement?

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Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Carl Bergstrand Role: Verksamhetsutvecklare

Email: carl.bergstrand@greencargo.com

KTH Railway Thesis

#Inlandsbanan



Ekonomisk analys av olika underhållsstrategier –

vad är mest kostnadseffektivt för Inlandsbanan?

Select one category to which this degree project corresponds the best

☒ 1 Rail track, Geotechnics, Bridge, Tunnel

☐ 2 Tech, Signalling, Electric, Data analysis

☐ 3 Vehicles

☐ 4 Traffic, Logistics, Signal, Capacity, Market

☐ 5 Properties and Land use

☐ 6 Sustainability and Environment

☐ 7 Construction, Production, Design

☒ 8 Business Management

☐ Other: _____

Background

Inlandsbanan AB förvaltar infrastrukturen Inlandsbanan på uppdrag av staten, bolaget äger också några motorvagnar samt lok. Ett litet bolag med begränsad budget och personalstyrka göra att vi behöver tänka annorlunda.

Problem description, tasks, and goals

Inlandsbanan vill se om det finns möjligheter till nya underhållsstrategier som gör det möjligt att få ut mer underhåll för pengarna, digitalisering eller annan metod vad är mest kostnadseffektivt?

Type of degree project (can be both)

☒ Master (20 weeks)

☒ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

☒ Swedish and/or ☐ English

Is Swedish a language requirement?

Ja Svenska är ett krav!

Possibility to work from our office

Tyvärr inga möjligheter att jobba från vårt kontor.

Contact person

Name: William Cederberg

Role: Fordonsstrateg

Email: William.cederberg@inlandsbanan.se

KTH Railway Thesis

#Inlandsbanan



Underhållsoptimering av äldre motorvagnar

Select one category to which this degree project corresponds the best

- | | |
|---|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
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| ☐ 5 Properties and Land use | |

Background

Inlandsbanan AB förvaltar infrastrukturen Inlandsbanan på uppdrag av staten, bolaget ägare också några motorvagnar samt lok. Ett litet bolag med begränsad budget och personalstyrka göra att vi behöver tänka annorlunda.

Problem description, tasks, and goals

Inlandsbanan äger två olika äldre typer av fordon Y1 och Y41, dessa fordon är av en äldre typ och kostnaderna för underhåll stiger, tanken är att digitalisera fordon med sensorer. Hur skulle vi kunna använda data från sensorerna för att minska våra underhållskostnader?

Type of degree project (can be both)

- ☒ Master (20 weeks)
☒ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☐ English

Is Swedish a language requirement?

Ja Svenska är ett krav!

Possibility to work from our office

Tyvärr inga möjligheter att jobba från vårt kontor.

Contact person

Name: William Cederberg

Role: Fordonsstrateg

Email: William.cederberg@inlandsbanan.se

KTH Railway Thesis

#Inlandsbanan



Utveckling av kostnadseffektiva lösningar spårförstärkning

Select one category to which this degree project corresponds the best

- | | |
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| ☐ 5 Properties and Land use | |

Background

Inlandsbanan AB förvaltar infrastrukturen Inlandsbanan på uppdrag av staten, bolaget är kommunägt och får bidrag från staten för att kunna förvalta banan. Vi ansvarar för drygt 10% av den svenska järnvägen.

Problem description, tasks, and goals

Inlandsbanan behöver förstärka spåret på vissa delar men även kunna höja hastigheten, vi skulle behöva hitta en lösning för att kunna göra detta på ett kostnadseffektivt sätt. Banan behöver få upp både bärigheten och hastigheterna för att kunder ska vilja nyttja infrastrukturen.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☒ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☐ English

Is Swedish a language requirement?

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Possibility to work from our office

Tyvärr inga möjligheter att jobba från vårt kontor.

Contact person

Name: William Cederberg

Role: Fordonsstrateg

Email: William.cederberg@inlandsbanan.se

KTH Railway Thesis

#Inlandsbanan



Återbruk av järnvägsmaterial – en hållbar upprustningsstrategi för Inlandsbanan

Select one category to which this degree project corresponds the best

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☒ 6 Sustainability and Environment

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Problem description, tasks, and goals

Inlandsbanan vill se om det finns möjligheter till att rusta banan med hjälp av återbruk från Trafikverket. När Trafikverket för större uppgraderingar så finns de kvar material som hade kunnat funka hos Inlandsbanan. Detta skulle kunna ge en kostnadseffektiv lösning för samhället. Här kommer dialoger behöva göras både med Inlandsbanan och Trafikverket samt med andra.

Type of degree project (can be both)

☒ Master (20 weeks)

Language for the thesis

☒ Swedish and/or ☐ English

☒ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Is Swedish a language requirement?

Ja Svenska är ett krav!

Possibility to work from our office

Tyvärr inga möjligheter att jobba från vårt kontor.

Contact person

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Role: Fordonsstrateg

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KTH Railway Thesis



Streamlined Analysis of Results from Forn Methods within SL's Signaling Safety Systems

Trafikförvaltningen

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

The thesis project focuses on developing methods and evaluation criteria for analyzing results after formal verification of a signaling safety system for rail traffic. A successful outcome is expected to be directly applicable by the organization for developing more cost-effective safety systems in SL traffic.

Problem description, tasks, and goals

Within the scope of the thesis project, your overall task will be to:

- Interpret and determine a reasonable level for the results of formal verification in order to avoid overanalysis and unreasonable errors regarding safety and functionality in the system/subsystem.
- Develop guidelines for the use and interpretation of formal methods within TF. The guidelines should take into account which parts of the system are being analyzed and how surrounding systems influence them.
- The outcome should provide clear and accessible guidance on how the results should be interpreted and applied.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☐ Swedish and/or ☐ English

Is Swedish a language requirement?

- ☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Andreas Mårtensson

Role: Assistant Safety Signaling Manager

Email: andreas.martensson@sl.se

Effektiviserad analys av resultat från formella metoder inom SL:s signalsäkerhetssystem

Trafikförvaltningen

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SL:s signalsäkerhetsanläggning är idag till stor del baserad på reläteknik med säkerhetslogik som manuellt granskas på krets nivå. För att utveckla och effektivisera arbetet bedöms det finnas stor potential i att göra en digital transformation och granska säkerhetslogiken baserat på matematiska formella metoder. Då formell verifiering idag tenderar att identifiera orealistiska felfall som riskerar att minska tilltron till och användbarheten av metoden som sådan behövs dock ett arbete för att öka användbarhet, stabilitet och tilltro till dessa verktyg. Exjobbet är därför inriktat på att utarbeta metoder och bedömningsgrunder för analys och resultat efter utförd formell verifiering av ett signalsäkerhetssystem för spårtrafik. Resultatet av ett lyckat arbete bedöms ha goda förutsättningar att direkt användas av verksamheten för utveckling av mer kostnadseffektiva säkerhetssystem i SL-trafiken.

Problem description, tasks, and goals

Inom ramen för ex-jobbet blir din övergripande uppgift att:

- Tolka och hitta rimlig nivå på resultatet av formell verifiering i syfte att undvika överanalys och orimliga fel med avseende på säkerhet och funktion i systemet/delsystemet
- Utforma riktlinjer för användning och tolkning av formella metoder inom TF. Riktlinjerna bör ta hänsyn till vilka delar av systemet som analyseras och hur omgivande system påverkar

Resultatet ska på ett lättillgängligt sätt ge ledning i hur resultatet ska tolkas och tillämpas.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☐ Swedish and/or ☐ English

Is Swedish a language requirement?

☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

☒ Yes ☐ No

Contact person

Name: Andreas Mårtensson

Role: kravställande specialist och bitr. signalsäkerhetsansvarig

Email: andreas.martensson@sl.se

KTH Railway Thesis



Mapping Integration Challenges in the Implementation of Computer-Based Technology in Relay-Based Interlocking Systems within SL's Signaling Safety Systems

Trafikförvaltningen

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SL's signaling safety system is currently largely based on relay technology with safety logic manually reviewed at the circuit level. To develop and streamline the work, there is considered to be great potential in undertaking a digital transformation. However, when integrating and implementing a computer-based platform for interlocking logic into the existing relay-based signal control solution for rail traffic, there is a risk of problems arising due to different behavior of the components. This may include differences in switching times and electrical behavior between the technologies. The computer-based platform may also have new terms of use that need to be addressed.

Therefore, the thesis project is focused on examining how a transition from relay-based to digital technology can be carried out. The outcome of a successful project is expected to have good potential to be directly used by the organization for developing more cost-effective signaling safety systems in SL traffic.

Problem description, tasks, and goals

Within the scope of the thesis project, your overall task will be to map out challenges and opportunities in a platform conversion while maintaining functionality and safety, in order to reduce risks and better predict potential problem situations. This includes:

- Describing differences between the platforms that may affect functionality, integration, or safety
- Proposing solutions to bridge these differences and developing practical recommendations for a platform conversion.

The thesis project is primarily limited to the blue and red lines of the metro, where work has already been initiated to carry out certain types of replacements from relay-based to digital technology.

Type of degree project (can be both)

☒ Master (20 weeks)

☐ Bachelor/Kandidat - Högscoleingenjör (10 weeks)

Language for the thesis

☐ Swedish and/or ☐ English

Is Swedish a language requirement?

☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

☒ Yes ☐ No

Contact person

Name: Andreas Mårtensson

Role: Assistant Safety Signaling Manager

Email: andreas.martensson@sl.se

Kartläggning av integrationsutmaningar vid implementering av datorbaserad teknik i reläbaserade signalställverk inom SL:s signalsäkerhetssystem

Trafikförvaltningen

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SL:s signalsäkerhetsanläggning är idag till stor del baserad på reläteknik med säkerhetslogik som manuellt granskas på krets nivå. För att utveckla och effektivisera arbetet bedöms det finnas stor potential i att göra en digital transformation. Vid integration och implementering av datorbaserad plattform för förreglingslogik i befintlig reläbaserad signalställverkslösning för spårtrafik finns dock risk att det dyker upp problem då komponenterna beter sig olika. Det kan t.ex. handla om att omslagstider och elektriskt beteende skiljer sig mellan teknikerna. Den datorbaserade plattformen kan också ha nya användarvillkor som behöver omhändertas.

Exjobbet är därför inriktat på att se över hur ett genomförande av byte från reläbaserad till digital teknik kan göras. Resultatet av ett lyckat arbete bedöms ha goda förutsättningar att direkt användas av verksamheten för utveckling av mer kostnadseffektiva signalsäkerhetssystem i SL-trafiken.

Problem description, tasks, and goals

Inom ramen för ex-jobbet blir din övergripande uppgift att kartlägga utmaningar och möjligheter vid en plattformskonvertering med bibehållen funktion och säkerhet för att minska risker och i högre grad kunna förutsäga problemsituationer. Det innefattar att:

- beskriva skillnader mellan plattformarna som kan ge funktions-, integrations eller säkerhetspåverkan
- föreslå lösningar för att överbrygga skillnaderna och att ta fram praktiska råd för en plattformskonvertering.

Exjobbet avgränsas primärt till tunnelbanans blå och röda linje, där arbete redan finns initierat för att genomföra vissa typer av utbyte från reläbaserad till digital teknik.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☐ Swedish and/or ☐ English

Is Swedish a language requirement?

- ☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Namn: Andreas Mårtensson

Roll: kravställande specialist och bitr. signalsäkerhetsansvarig

Email: andreas.martensson@sl.se

KTH Railway Thesis



Measurement of Congestion in SL's Architecture

Trafikförvaltningen

Select one category to which this degree project corresponds the best

- | | |
|---|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☒ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: |
- Arkitektur _____
- ☐ 5 Properties and Land use

Background

Staff at the Public Transport Administration are often asked whether there is congestion in a passenger environment (station, platform, terminal) or confronted with the assertion that a passenger environment is congested. Determining whether a physical environment is crowded in relation to its passenger flows is difficult to answer. This depends on many factors, such as the physical design and where in the passenger flow the measurement is taken, which data are used, the number of travelers per day, per peak hour in the morning/afternoon, maximum 15-minute intervals, and so on.

The Public Transport Administration does not currently have a method to answer this question. However, the need to be able to perform a simple calculation to get an indication of congestion at, for example, a station has existed for a long time.

Problem description, tasks, and goals

Within the scope of the thesis project, your task will be to:

- Investigate and describe existing methods for calculating congestion in physical environments (not limited to public transport; can include airports, shopping centers, etc.).
- Describe/draw the physical environments related to existing methods for calculating congestion.
- Investigate and describe if and how existing methods are applicable to the Public Transport Administration's passenger environments, and how they can be designed. (Text and illustrations)
- Examine the different parts of a passenger environment and how they are affected by passenger flows, such as single-level spaces, fixed stairs, escalators, elevators, inclined elevators, moving walkways, platforms (of various widths), doorways, and fare gate lines.

- Develop a simple method for calculating congestion in SL's environments and relate it to the different parts of a passenger environment.
- Compare the results of the developed method with a detailed flow analysis using microsimulation for some of the Public Transport Administration's environments.
- Compare the results of the developed method with a visual inspection.

Type of degree project (can be both)

☒ Master (20 weeks)

☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

☐ Swedish and/or ☐ English

Is Swedish a language requirement?

☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

☒ Yes ☐ No

Contact person

Name: Johanna Cotfas

Role: Passenger Environment Strategy Specialist

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Mätning av trängsel i SLs arkitektur

Trafikförvaltningen

Select one category to which this degree project corresponds the best

- | | |
|---|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☒ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: |
- Arkitektur _____
- ☐ 5 Properties and Land use

Background

Trafikförvaltningens tjänstepersoner får ofta frågan om det är trängsel i en resenärsmiljö (station, plattform, terminal) eller påståendet om att en resenärsmiljö har trängsel. Frågan om en fysisk miljö är trång i relation till dess resenärsströmmar är svår att besvara. Det beror på många faktorer, den fysiska utformningen och var i resenärsstråket man mäter, vilka data man använder, resande per dygn, per maxtimme förmiddag/eftermiddag, maxkvart mm.

Trafikförvaltningen har inte en metod för att kunna svara på denna fråga. Men behovet att kunna göra en enklare beräkning för att få en indikation om trängseln på exempelvis en station har funnits länge.

Problem description, tasks, and goals

Inom ramen för ex-jobbet blir din uppgift:

- Att undersöka och beskriva befintliga metoder för att beräkna trängsel i fysiska miljöer (måste inte bara vara kollektivtrafik, kan vara flygplatser, köpcentrum mm).
- Att beskriva/rita upp de fysiska miljöerna kopplat till befintliga metoder för att beräkna trängsel.
- Att undersöka och beskriva om och hur befintliga metoder är applicerbara på trafikförvaltningens resenärsmiljöer, och hur de kan utformas. (Text och bild)
- Att undersöka de olika delarna av en resenärsmiljö och hur de påverkas av resenärsströmmar, utrymmen i en nivå, fasta trappor, rulltrappor, hissar, snedbanehissar, rullband, plattformar (olika bredder), dörrpartier, spärrlinjer.
- Att ta fram en enkel metod för att beräkna trängsel i SLs miljöer och koppla den till de olika delarna av en resenärsmiljö.
- Att jämföra resultatet av den framtagna metoden med en detaljerat framtagna flödesanalys med microsimulering för några av trafikförvaltningens miljöer.
- Att jämföra resultatet av den framtagna metoden med en okulär besiktning.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☐ Swedish and/or ☐ English

Is Swedish a language requirement?

- ☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Johanna Cotfas

Role: Resenärsmiljöstrateg

Email: Johanna.cotfas@sl.se

KTH Railway Thesis



Factors affecting Dynamic Pricing Models Railway Operators

Sweco Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SWECO is the leading architecture and technical consultant company in Europe with more than 22 000 employees throughout the continent. Within the railway sector, we have experts in all technical disciplines, e.g. track technology and design, signaling systems and traffic control, electric power system, rolling stock and railway capacity. This degree project proposal is set in the context of the pricing, AI and railway capacity.

Dynamic pricing is a crucial strategy for optimizing railway operations by adjusting ticket prices based on demand fluctuations. With advancements in AI, machine learning, and real-time data processing, there is an opportunity to explore more sophisticated approaches to dynamic pricing. This project invites students to investigate how these technologies can be applied to enhance pricing models in the railway industry.

Problem description, tasks, and goals

Current dynamic pricing systems may not fully account for real-time factors such as local events, weather conditions, or customer preferences. Additionally, the potential for dynamic pricing to support sustainability goals, such as promoting off-peak travel or reducing carbon emissions, is not always explored. The challenge is to identify significant variables and patterns in data that can improve pricing strategies while aligning with both business and environmental objectives. The aim of this project is to develop and test an enhanced dynamic pricing model for railways. Students will explore advanced AI techniques, integrate data, and assess the impact of various factors on pricing decisions. To deepen their understanding, students are encouraged to conduct interviews or meetings with industry operators or customers to gather insights on key variables and perspectives. This research will help in identifying patterns and developing a more responsive and effective pricing model.

Type of degree project (can be both) Language for the thesis

- ☒ Master (20 weeks) ☒ Swedish and/or ☒ English
- ☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Is Swedish a language requirement?

☐ Yes ☐ No x No, but Swedish is a requirement for future employment

Possibility to work from our office

x Yes ☐ No

Contact persons:

Name: Umar Aslam Role: Railway capacity and AI (Railway traffic & Logistics)

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Name: Jennifer Warg Role: Railway capacity (Railway traffic & Logistics)

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Name: Jakob Lindbergh Role: Railway capacity (Railway traffic & Logistics)

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KTH Railway Thesis



Intermodal Reloading Hubs

Sweco Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SWECO is the leading architecture and technical consultant company in Europe with more than 22 000 employees throughout the continent. Within the railway sector, we have experts in all technical disciplines, e.g. track technology and design, signaling systems and traffic control, electric power system, rolling stock and railway capacity. This degree project proposal is set in the context of the railway capacity and logistics for freight operations. The intermodal freight transport has continuously increased during recent decades. To make the transitions between transport modes, intermodal terminals are used. However, these require a lot of space and are quite time consuming in the reloading sequence.

Problem description, tasks, and goals

This degree project seeks to dig deep into the future of intermodal reloading hubs. There are high demands on the effectiveness of logistical capacity and flow of both goods and vehicles. The study should include a solid literature study and discussion regarding the intermodal freight of today and the future, with the focus on the reloading hubs. How is the reloading of goods functioning today and how can it be improved? Depending on the outline of the study, simulations with Railsys can be included.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☒ English

Is Swedish a language requirement?

- ☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact persons

Name: Jennifer Warg Role: Railway capacity (Railway traffic & Logistics)

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Name: Jakob Lindbergh Role: Railway capacity (Railway traffic & Logistics)

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Name: Umar Aslam Role: Railway capacity and AI (Railway traffic & Logistics)

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KTH Railway Thesis



More Efficient Maintenance Planning

Sweco Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SWECO is the leading architecture and technical consultant company in Europe with more than 22 000 employees throughout the continent.

Within the railway sector, we have experts in all technical disciplines, e.g. track technology and design, signaling systems and traffic control, electric power system, rolling stock and railway capacity. This degree project proposal is about maintenance strategies on the Iron ore line in northern Sweden. Great volumes of freight with large financial values are transported every day at that line. Every year planned maintenance windows on the line effects the possibility to transport freight and as a result have impact on the industries' finances.

Problem description, tasks, and goals

This thesis proposal focuses on the possibility to find alternative maintenance solutions from a traffic point of view. This may come at a greater maintenance cost but on the contrary generate more value for the industries transporting goods. The methods used could involve timetable construction in RailSys, socioeconomic evaluation and financial analysis.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

☒ Swedish and/or ☐ English

Is Swedish a language requirement?

☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

☒ Yes ☐ No

Contact persons

Name: Jennifer Warg Role: Railway capacity (Railway traffic & Logistics)

Email: Jennifer.Warg@sweco.se

Name: Jakob Lindbergh Role: Railway capacity (Railway traffic & Logistics)

Email: Jakob.Lindbergh@sweco.se

Name: Umar Aslam Role: Railway capacity and AI (Railway traffic & Logistics)

Email: Umar.Aslam@sweco.se

KTH Railway Thesis



Motorail traffic in Sweden

Sweco Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SWECO is the leading architecture and technical consultant company in Europe with more than 22 000 employees throughout the continent. Within the railway sector, we have experts in all technical disciplines, e.g. track technology and design, signaling systems and traffic control, electric power system, rolling stock and railway capacity. This degree project proposal is about possibilities for motorail in Sweden.

Motorail, where passengers travel in regular passenger coaches while their vehicles are transported on car-transport wagons, could be a solution to manage seasonal peaks in holiday car travel, reduce the environmental impact of holiday trips, and decrease accident risks on the road network. This can be achieved by replacing long-distance car journeys with train journeys, with the car only used for transportation to and from the motorail terminals. Motorail combine the energy efficiency and low emissions per passenger-kilometer of trains with the range, convenience, and flexibility of cars during vacations. Additionally, the long-distance travel can be conducted overnight as a night train.

Problem description, tasks, and goals

A prior thesis researched the possibility to implement motorail traffic in Sweden and there is a lot of research areas to continue researching. A further study could include examining the attitudes of travelers towards and their willingness to travel by motorail, investigating customer demographics and their travel habits, studying operators and infrastructure owners' perspectives on motorail, and investigating financing models for motorail traffic and associated infrastructure. Further studies could also investigate the socio-economic effects of motorail traffic, comparisons with other traffic to determine which should be prioritized in the train planning process, optimal geographic location, and design of motorail stations.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

☒ Swedish and/or ☐ English

Is Swedish a language requirement?

- ☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

x Yes ☐ No

Contact persons

Name: Jennifer Warg Role: Railway capacity (Railway traffic & Logistics)

Email: Jennifer.Warg@sweco.se

Name: Jakob Lindbergh Role: Railway capacity (Railway traffic & Logistics)

Email: Jakob.Lindbergh@sweco.se

Name: Umar Aslam Role: Railway capacity and AI (Railway traffic & Logistics)

Email: Umar.Aslam@sweco.se

KTH Railway Thesis



Effects of prioritising freight operation in timetable construction

Sweco Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SWECO is the leading architecture and technical consultant company in Europe with more than 22 000 employees throughout the continent. Within the railway sector, we have experts in all technical disciplines, e.g. track technology and design, signaling systems and traffic control, electric power system, rolling stock and railway capacity. This degree project proposal is about prioritizing freight traffic in the timetable allocation.

Today, the capacity allocation is a complicated process conducted every year to enable a secure and functioning traffic on the rail network. The process involves evaluation of demand and supply in relation to socioeconomic benefits. Due to the different characteristics between freight and passenger traffic in combination with limited available capacity, there will be conflicts and a need to prioritise.

Problem description, tasks, and goals

Freight traffic is usually disfavoured and referred to night time operation and long transfer times due to overtakes by faster passenger trains. This thesis proposal focuses on alternatives to the usual capacity allocation. Taking aim in firstly planning for freight traffic and secondly passenger traffic and evaluating its effects. This could be done in the form of case study consisting of a timetable construction in RailSys on a main line or an important goods corridor. Followed by an evaluation of socioeconomic and environmental benefits.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☐ English

Is Swedish a language requirement?

- ☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact persons

Name: Jennifer Warg Role: Railway capacity (Railway traffic & Logistics)

Email: Jennifer.Warg@sweco.se

Name: Jakob Lindbergh Role: Railway capacity (Railway traffic & Logistics)

Email: Jakob.Lindbergh@sweco.se

Name: Umar Aslam Role: Railway capacity and AI (Railway traffic & Logistics)

Email: Umar.Aslam@sweco.se

KTH Railway Thesis



Statistical analysis of railway traffic

Sweco Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|---|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☒ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

SWECO is the leading architecture and technical consultant company in Europe with more than 22 000 employees throughout the continent. Within the railway sector, we have experts in all technical disciplines, e.g. track technology and design, signaling systems and traffic control, electric power system, rolling stock and railway capacity. This degree project proposal is about exploring historical data for improving the railway system.

The Swedish railway system is very complex. In order to utilize its limited capacity in an optimal way, historical data can be used to analyse where delays occur frequently.

Problem description, tasks, and goals

There are lots of possible questions to explore. For example switches and crossings - that failures of them cause delays are known, but it is not known which kind of failures that causes the delays. Do all different failures cause delays or is it only some failures that does? This thesis would investigate how different switch failures causes delays and by how much. There would also be a need to classify the different failures in order to see which ones that affects the punctuality. Other topics are for example the punctuality of freight trains that are leaving ahead of schedule, an analysis of parts of the timetable where delays often occur, or for different time periods with changes in the timetable/infrastructure due to for example seasonal variations or construction works.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☒ English

Is Swedish a language requirement?

- ☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact persons

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Email: Jennifer.Warg@sweco.se

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Email: Jakob.Lindbergh@sweco.se

Name: Umar Aslam Role: Railway capacity and AI (Railway traffic & Logistics)

Email: Umar.Aslam@sweco.se

Thesis examples from Systra AB

1. Image recognition of rolling stock components during inspection
2. Traffic systems for Skåne. A solution that suits all different types of Train
3. Using AI in the design phase.
4. Challenges of implementing a GOA4 metro system in a new country?
5. Safety systems that needs to be implemented in a GOA4 metro?
6. Challenges in providing public confidence in a driveless metro?
7. How to solve construction staging associated with building a new metro when the civils and traffic systems have different time plans?
8. Research into the different automatic systems on a GOA4 metro, for example issues with platform screen doors should something get trapped?

Interested, please contact **Mikael Cederlund** at **Systra**
mcederlund@systra.com



Leveransadress: SYSTRA AB; Hanstavägen 31, 164 53 Kista, Sverige

Besöksadress: Färögatan 33, 164 51 Kista, Sverige (Anmälan i reception för Kista Science Tower)

www.systra.se

Längre spannlängder för kontaktledningar

Trafikverket

Select one category to which this degree project corresponds the best

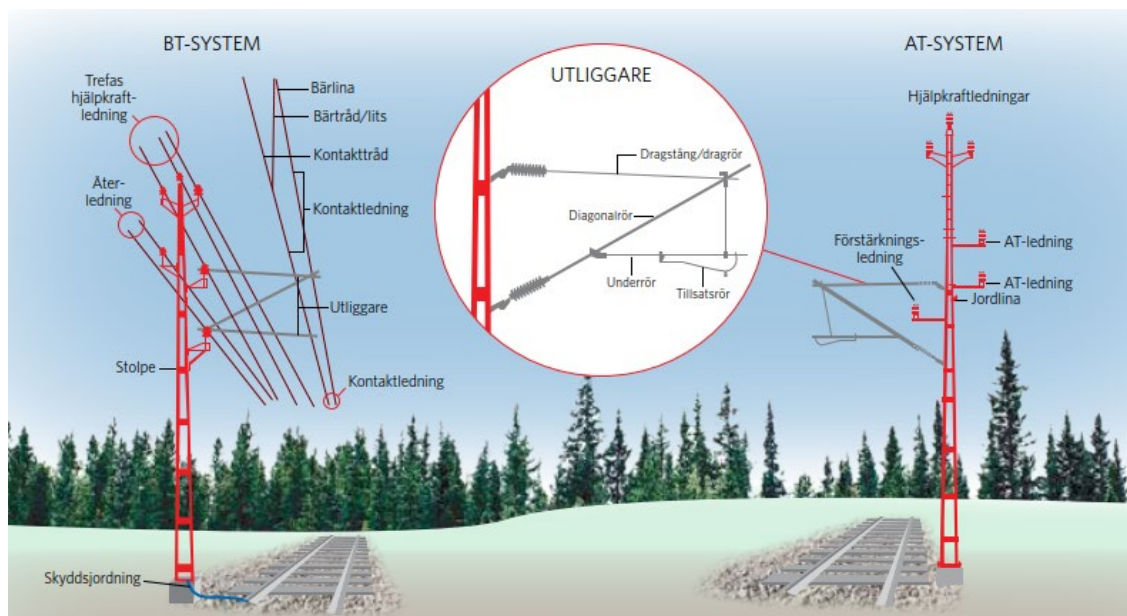
- | | |
|---|---|
| ☐ 1 Rail track, Geotechnics, bridge, tunnel | ☐ 6 Properties and Land use |
| ☒ 2 Tech, Signalling, Electric, data analysis | ☐ 7 Sustainability and Environment |
| ☐ 3 Vehicles | ☒ 8 Business Management |
| ☐ 4 Traffic Planning, market and logistics | ☐ Other: _____ |
| ☒ 5 Construction, production, design | |

Background

Behovet av reinvestering av ny kontaktledning kommer mångdubblas de kommande åren och för att klara av detta behöver nya metoder, tekniker och utformning av anläggningen genomföras. En möjlig teknisk åtgärd är att öka spannlängden vilket medför färre antal komponenter vilket i sin tur påverkar de direkta materialkostnaderna men även indirekta kostnader i form av minskad tid gällande projektering, installation och underhåll.

Problem description

Syftet med projektet är att utreda möjligheten att bygga enklare, snabbare och billigare kontaktledningsanläggningar genom att förlänga spannlängden.



Tasks

Arbetet innebär att en utredning genomförs för att kontrollera flera olika aspekter som påverkas av längre spannlängder. Utredningen görs för 2 typer av hängverk som idag konkurreras om att få installeras.

Omfattningen av utredningen ska primärt innefatta:

1. Hur långa spannlängder är möjliga att bygga med 15/15 system av hängverk avseende vindavdrift
2. Hur påverkas kvalitet på strömavtagning av längre spannlängder
3. Hur påverkas livslängden på kontaktledning och strömavtagare
4. Hur påverkas övriga friledningar av längre spannlängder
5. Ekonomiska resultat med avseende på den direkta materialkostnaden med längre spannlängder
6. Välja ut en referenssträcka och bedöma vinsten i materialkostnad om längre spannlängder hade använts

Om tid finns eller om fler studenter ingår i arbetet kan utredningen utökas, det finns förslag till fördjupningsfrågor som studenten kan välja på beroende på intresseområdet.

Method

Statiska beräkningar utförs med existerande beräkningsblad i Excel framtagna av Trafikverket. För beräkning av strömavtagningskvalitet utförs simuleringar i 1:a hand i det existerande simuleringsprogram i ANSYS som finns hos KTH, där även handledare finns.

Vid utökad omfattning innefattande inverkan på ekonomi blir grunden intervjuer och samtal med personer inom Trafikverket men fakta behöver också sökas hos entreprenörer som utför installationer och konsulter för projektering. Handläggare på Trafikverket kommer att ge stöttning och hjälp med kontakter.

Ersättning: 1000 kr/poäng vid genomfört examensarbete (Primära delen).

Lite mer beskrivningar av kontaktledningssystem finns att läsa i Lärobok Kontaktledning:
[Länk](#)

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☐ English

Is Swedish a language requirement?

- ☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

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Supervisor

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Jimmy Andersson Specialist
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010-123 11 87

The effect of track gauge widening on wear and forces between wheels and rails

Trafikverket

Select one category to which this degree project corresponds the best

- | | |
|---|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☒ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

In tight curves, with radii of less than 300 meters, track forces can be particularly high, which leads to increased wear on both wheels and rails. In the worst case, the high forces can contribute to derailment.

To reduce wheel-rail forces, measures such as track gauge widening and rail lubrication are used. These measures can reduce wear and improve operational safety, but it is not always practical or technically possible to install lubrication equipment or apply the desired track gauge widening.

A further problem is that the increased forces do not only occur in the curve itself, but also continue a few meters after the curve. This can lead to accelerated wear on sensitive components such as switches if they are located near curves.

Purpose

The purpose of the study is to investigate how track gauge widening in tight curves and locomotives with long and rigid wheelbases (for example locomotives V5 and Z70) affect wheel-rail forces, wear and the risk of climbing.

It is also desirable to investigate how long these forces act after the curves, when the curves are connected to a transition curve or directly transition to a straight section.

The content of the work

The work begins with a global analysis and a literature study to compare track gauge practices in different countries with the conditions in Sweden. Study the different modelling possibilities, i.e. simplified quasi-static curving model or a complete MBS model. Simulations are then carried out for different train types and different combinations of track gauge additions and curve radii. The expected impact of gauge widening on components located near tight curves will also be investigated.

Type of degree project (can be both)

- ☐ Master (20 weeks)
☐ Bachelor/Kandidat - Höskoleingenjör (10 weeks)

Language for the thesis

- ☐ Swedish and/or ☐ English

Is Swedish a language requirement?

☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

☐ Yes ☒ No

Contact person

Name: Saad Khan

Role: Trafikverket Maintenance

Email: saad.khan@trafikverket.se

Possible examiner at KTH

Carlos Casanueva

Role: Associate Profesor

carlosc@kth.se

Examensarbete - Förenklat villkorsbeslut för tungvillkor av specialtransporter

Vill du ta reda på möjligheter för att förenkla villkorsbeslut genom att integrera information och data från olika system (om anläggningens status) för att underlätta för handläggare i beslutsfattande för tungvillkor av specialtransporter?

Plats: Solna

Sista ansökningsdag: 15 okt. 2025

Om jobbet

I dagsläget krävs mycket manuell handpåläggning av teknikhandläggarna. Bedömningarna baseras i stor utsträckning på erfarenhet och kunskap om anläggningens tekniska tillstånd och tar hjälp av våra IT-system. Syftet med examensarbetet är att hitta andra arbetssätt för att underlätta för handläggare som arbetar med tungvillkor för specialtransporter. Information, data och teknik finns men i olika system, vilket gör det tidskrävande att göra en helhetsbedömning vid beslut om tillstånd för tunga transporter på specifika sträckor i anläggningen. Enligt Järnvägsnätsbeskrivningen 2026 (JNB) framgår i kapitel 5.4.2 Transportvillkor och transporttillstånd för specialtransporter samt i kapitel 2 vilka villkor som gäller för tunga transporter och när en ansökan om tillstånd måste göras. Operatören har ett ansvar att kontrollera om transporten överskrider något av infrastrukturens begränsningar som anges i JNB. Om transporten klassas som tung eller på annat sätt överskrider gällande krav behöver operatören ansöka om tillstånd via Trafikverkets system SpecTra. Ansökan prövas av Trafikverket som sedan avgör om transporten kan tillåtas på den aktuella sträckan. I dagsläget sker bedömningen ofta med stöd av handläggarnas erfarenhet och deras kännedom om anläggningen. För vissa områden, exempelvis broar, finns redan utvecklade systemstöd (BATMAN) som ger automatiska besked om tillstånd kan beviljas. Inom spår- och geoteknikområdet är processen mer komplex, men liknande digitala lösningar skulle kunna ge värdefulla stöd även där.

Detta examensarbete kan omfatta antingen 15 eller 30 högskolepoäng och ska skrivas i par. Rapporten skall sammanställas på svenska. Arbetet kan skrivas helt på distans eller till viss del på kontoret i Solna.

Kvalifikation

För att lyckas med detta uppdrag behöver du vara initiativtagande och driven. Du har god förmåga att planera och strukturera ditt angreppssätt i såväl stora som små frågor, samt god analytisk förmåga. Du trivs att jobba i grupp med olika personer men är även bra på att arbeta enskilt.

Vi söker dig som:

- är studerande på högskole-/universitetsnivå med relevant inriktning för detta uppsatsämne, t ex systemvetenskap, civilingenjör i samhällsbyggnad, civilingenjör i industriell ekonomi, civil-/högskoleingenjör i maskinteknik, högskoleingenjör i byggt teknik, civilingenjör i datateknik/ informationsteknik/ datavetenskap
- är behörig att skriva examensarbete under vt 2026 (du behöver bifoga LADOK-utdrag till ansökan)
- har mycket goda kunskaper i svenska i både tal och skrift.

Läs mer: <https://www.trafikverket.se/om-oss/jobba-hos-oss/lediga-jobb/underhall/examensarbete---forenklat-villkorsbeslut-for-tungvillkor-av-specialtransporter-182025401/>

Examensarbete - Förenklat villkorsbeslut för tungvillkor av specialtransporter

Vill du ta reda på möjligheter för att förenkla villkorsbeslut genom att integrera information och data från olika system (om anläggningens status) för att underlätta för handläggare i beslutsfattande för tungvillkor av specialtransporter?

Plats: Solna

Sista ansökningsdag: 15 okt. 2025

Om jobbet

I dagsläget krävs mycket manuell handpåläggning av teknikhandläggarna. Bedömningarna baseras i stor utsträckning på erfarenhet och kunskap om anläggningens tekniska tillstånd och tar hjälp av våra IT-system. Syftet med examensarbetet är att hitta andra arbetssätt för att underlätta för handläggare som arbetar med tungvillkor för specialtransporter. Information, data och teknik finns men i olika system, vilket gör det tidskrävande att göra en helhetsbedömning vid beslut om tillstånd för tunga transporter på specifika sträckor i anläggningen. Enligt Järnvägsnätsbeskrivningen 2026 (JNB) framgår i kapitel 5.4.2 Transportvillkor och transporttillstånd för specialtransporter samt i kapitel 2 vilka villkor som gäller för tunga transporter och när en ansökan om tillstånd måste göras. Operatören har ett ansvar att kontrollera om transporten överskrider något av infrastrukturens begränsningar som anges i JNB. Om transporten klassas som tung eller på annat sätt överskrider gällande krav behöver operatören ansöka om tillstånd via Trafikverkets system SpecTra. Ansökan prövas av Trafikverket som sedan avgör om transporten kan tillåtas på den aktuella sträckan. I dagsläget sker bedömningen ofta med stöd av handläggarnas erfarenhet och deras kännedom om anläggningen. För vissa områden, exempelvis broar, finns redan utvecklade systemstöd (BATMAN) som ger automatiska besked om tillstånd kan beviljas. Inom spår- och geoteknikområdet är processen mer komplex, men liknande digitala lösningar skulle kunna ge värdefulla stöd även där.

Detta examensarbete kan omfatta antingen 15 eller 30 högskolepoäng och ska skrivas i par. Rapporten skall sammanställas på svenska. Arbetet kan skrivas helt på distans eller till viss del på kontoret i Solna.

Kvalifikation

För att lyckas med detta uppdrag behöver du vara initiativtagande och driven. Du har god förmåga att planera och strukturera ditt angreppssätt i såväl stora som små frågor, samt god analytisk förmåga. Du trivs att jobba i grupp med olika personer men är även bra på att arbeta enskilt.

Vi söker dig som:

- är studerande på högskole-/universitetsnivå med relevant inriktning för detta uppsatsämne, t ex systemvetenskap, civilingenjör i samhällsbyggnad, civilingenjör i industriell ekonomi, civil-/högskoleingenjör i maskinteknik, högskoleingenjör i byggt teknik, civilingenjör i datateknik/ informationsteknik/ datavetenskap
- är behörig att skriva examensarbete under vt 2026 (du behöver bifoga LADOK-utdrag till ansökan)
- har mycket goda kunskaper i svenska i både tal och skrift.

Läs mer: <https://www.trafikverket.se/om-oss/jobba-hos-oss/lediga-jobb/underhall/examensarbete---forenklat-villkorsbeslut-for-tungvillkor-av-specialtransporter-182025401/>

KTH Railway Thesis



Capacity analysis project

Tyréns Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|--|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☒ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

Tyréns are specialists in designing cities, the built environment and infrastructure solutions with 2000 employees in Sweden. We are working with traffic planning and capacity analysis on railways creating timetables and performing simulations of train traffic.

Problem description, tasks, and goals

Thesis proposal to do capacity analysis by timetable planning and/or simulations with capacity tools on a case study. For example contingency planning, with traffic reductions and early turnarounds to restabilize traffic operations when distributions occurs in a commuter train system. Another possibility could be investigating line capacity increases for cross border traffic between Norway and Sweden on the Meråker-line Trondheim – Storlien.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☐ Bachelor/Kandidat - Höskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☒ English

Is Swedish a language requirement?

- ☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Albin Kvarnefalk

Role: Capacity analyst

Email: albin.kvarnefalk@tyrens.se

Application form: <https://www.tyrens.se/karriaer/jobb/?id=2788>

Please apply for the thesis via the application form to ensure GDPR compliance. Do not send any CV:s or cover letters via email. Questions about the thesis are encouraged via email.

KTH Railway Thesis



Kraftberäkningar på kontaktledningsstolpar och kontaktledningsbryggor

Tyréns Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|---|--|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☒ 2 Tech, Signalling, Electric, Data analysis | ☒ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

Tyréns är ett av Sveriges ledande konsultföretag inom samhällsbyggnad. Tyréns arbetar med innovativa lösningar inom infrastruktur, energi och miljö – och har ett starkt fokus på hållbarhet och framtidens transportsystem. Inom järnvägssektorn bidrar Tyréns till utveckling och planering av effektiva, pålitliga och miljövänliga lösningar.

Problem description, tasks, and goals

Kraftberäkningar på kontaktledningsstolpar och kontaktledningsbryggor

Identifiera vilka krafter som stolpar och bryggor utsätts för (islaster, vindlaster, egenvikter mm). Ta fram en beräkningsmodell i t.ex. Excel där man på ett enkelt sätt kan få fram laster för en specifik stolpe.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☒ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☒ English

Is Swedish a language requirement?

- ☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Stefan Svensson

Role: Kontaktledningsprojektör

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Application form: <https://www.tyrens.se/karriaer/jobb/?id=2788>

Please apply for the thesis via the application form to ensure GDPR compliance. Do not send any CV:s or cover letters via email. Questions about the thesis are encouraged via email.

KTH Railway Thesis



Quantifying use of railway macadam

Tyréns Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|---|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☒ Other: Railway macadam |
| ☐ 5 Properties and Land use | |

Background

Tyréns are specialists in designing cities, the built environment and infrastructure solutions with 2000 employees in Sweden.

Discussions with contractors and site supervisors have shown that the theoretical quantity of macadam specified in “AMA Anläggning 2023” (DCH.311 and DCH.331) is often significantly lower than the actual amount used in projects. For example, the theoretical quantity according to code “DCH.331” in a project was 998 tons, while the measured amount was 2,805.38 tons—a difference of 281%.

Problem description, tasks, and goals

One reason for these discrepancies is that measurements during the planning of track geometry do not always take into account the actual shape and height variations of the track, especially the raised profile of the rails. In practice, the entire track—including the inner rail and the sloped sections—moves upward, not just in a flat manner. If real site conditions are not considered during the design phase, there is a risk of incorrect material calculations and construction plans.

To avoid this, clear requirements from Trafikverket are needed, and actual conditions must always be considered in both design and measurement. As a part of the project, the contractors’s technique for laying macadam will also be analyzed to assess potential material loss and further improve the accuracy of material calculations. The goal is to improve the accuracy of material calculations and create more reliable and efficient projects.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☒ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☐ English

Is Swedish a language requirement?

- ☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Karin Fenger-Krog

Role: Group/department manager. Avdelningschef

Email: Karin.fenger-krog@tyrens.se

Application form: <https://www.tyrens.se/karriar/jobb/?id=2788>

Please apply for the thesis via the application form to ensure GDPR compliance. Do not send any CV:s or cover letters via email. Questions about the thesis are encouraged via email.

KTH Railway Thesis



Data for machine control

Tyréns Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|---|---|
| ☒ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☐ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☒ Other: Machine control |
| ☐ 5 Properties and Land use | |

Background

Tyréns are specialists in designing cities, the built environment and infrastructure solutions with 2000 employees in Sweden. This thesis aims to investigate standardization of data for machine control in railway assignments.

Problem description, tasks, and goals

In railway projects, the production time is often severely limited because the work usually requires the track to be closed. At the same time, modern 3D machine control systems are available that can make excavation and staking out more efficient, but the design documentation varies greatly between projects and consulting firms. This results in a lot of manual processing for surveyors and, in the worst case, can make it impossible to use GPS-based machine control.

- Map current deliveries and requirements for excavation and staking documentation.
- Define uniform ordering frameworks as well as file formats/structure for machine control.
- Clarify roles, responsibilities, and quality control (from design to staking out).
- Develop example and template files to support consistent delivery.

The overall goal is to provide Trafikverket with clear, uniform ordering frameworks for ground and machine control documentation so that 3D machine control can be used consistently, manual work is reduced, and delivery quality is ensured within tight production windows.

Type of degree project (can be both)

- ☒ Master (20 weeks)
☒ Bachelor/Kandidat - Höskoleingenjör (10 weeks)

Language for the thesis

- ☒ Swedish and/or ☐ English

Is Swedish a language requirement?

- ☒ Yes ☐ No ☐ No, but Swedish is a requirement for future employment

Possibility to work from our office

- ☒ Yes ☐ No

Contact person

Name: Karin Fenger-Krog

Role: Group/department manager. Avdelningschef

Email: Karin.fenger-krog@tyrens.se

Application form: <https://www.tyrens.se/karriar/jobb/?id=2788>

Please apply for the thesis via the application form to ensure GDPR compliance. Do not send any CV:s or cover letters via email. Questions about the thesis are encouraged via email.

Integration av solenergi för elförsörjning inom järnväg

Tyréns Sverige AB

Select one category to which this degree project corresponds the best

- | | |
|---|---|
| ☐ 1 Rail track, Geotechnics, Bridge, Tunnel | ☐ 6 Sustainability and Environment |
| ☒ 2 Tech, Signalling, Electric, Data analysis | ☐ 7 Construction, Production, Design |
| ☐ 3 Vehicles | ☐ 8 Business Management |
| ☐ 4 Traffic, Logistics, Signal, Capacity, Market | ☐ Other: _____ |
| ☐ 5 Properties and Land use | |

Background

Järnväg är en av de mest energieffektiva transportformerna och spelar en viktig roll i ett mer hållbart samhälle. Trots detta är energiförbrukning inom järnväg hög och kostsam. Det finns delar av järnvägsnätet som är svåra att försörja med el på ett effektivt sätt, särskilt de som passerar genom skogar och fjäll. Där brukar kabeldragning vara svårt och kostsam. Samtidigt ökar tillgången och effektivitet hos förnybara energikällor som t.ex. solceller och teknologi som kan spara energi, som batterier. Det finns därför intresse för att undersöka hur dessa energikällor kan kombineras inom järnväg.

Detta examensarbete genomförs i samarbete med Tyréns, ett av Sveriges ledande konsultföretag inom samhällsbyggnad. Tyréns arbetar med innovativa lösningar inom infrastruktur, energi och miljö – och har ett starkt fokus på hållbarhet och framtidens transportsystem. Inom järnvägssektorn bidrar Tyréns till utveckling och planering av effektiva, pålitliga och miljövänliga lösningar.

Problem description, tasks, and goals

Energiförbrukningen hos järnvägssystemet är hög. På vissa platser och i skogsområden är det både dyrt och tekniskt utmanande att dra fram elkablar till t.ex. signalanläggningar, teknikhus, övervakningssystem eller belysning. Dessa installationer kräver oftast kontinuerlig elförsörjning, vilket idag oftast sker via långa kabeldragningar från det centrala elnät.

Problem:

- Hög energiförbrukning
- Höga installations och underhållskostnader
- Energiförluster längs kablar
- Sårbarhet vid kabelbrott (stormar)

Mål:

- Utredda hur solceller och batterier kan används som fristående energikällor inom järnväg samt vilka typer av utrustning kan försörjas med solceller eller kombinerade energikällor .
- Minska behöver av långa kabeldragningar och energiförluster.
- Identifiera platser där sådan lösning kan ge ekonomisk vinst jämfört med dagens system.
- Analysera hur kan en övergång till lokala energiförsörjning kan påverka järnvägssäkerheten, t.ex. för signalsystem.

Type of degree project (can be both)

☒ Master (20 weeks)

☒ Bachelor/Kandidat - Högskoleingenjör (10 weeks)

Language for the thesis

☒ Swedish and/or ☒ English

Is Swedish a language requirement?

☐ Yes ☐ No ☒ No, but Swedish is a requirement for future employment

Possibility to work from our office

☒ Yes ☐ No

Contact person

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Role: Avdelningschef, järnväg EST

Email: Andreas.Kasstrom@tyrens.se

Application form: <https://www.tyrens.se/karriar/jobb/?id=2788>

Please apply for the thesis via the application form to ensure GDPR compliance. Do not send any CV:s or cover letters via email. Questions about the thesis are encouraged via email.

Examensarbeten hos VR Snabbtåg 2025/2026

1. Förutsägbart underhåll för fordon X74 – kan vi förutse kritiska fel med hjälp av driftdata?

- **Kategori:** Fordon / underhåll
- **Bakgrund:** X74-flottan är relativt liten och enstaka fel kan snabbt påverka trafiken. Idag sker mycket av underhållet schemabaserat, men det finns tillgång till driftdata och felstatistik.
- **Syfte:** Utredda om dataanalys och maskininlärning kan användas för att förutse fel på nyckelkomponenter och därmed minska akuta stopp.
- **Metod:** Datauttag från fordonsdiagnostik, statistisk analys, ev. enklare ML-modell. Jämförelse mellan faktiska fel och prediktion.

2. Livslängdsanalys av komponenter på fordon X74 i nordiskt klimat

- **Kategori:** Fordon / underhåll
- **Bakgrund:** Vinterklimatet med kyla, is och snö skapar utmaningar för snabbtåg som inte är fullt anpassade till nordiska förhållanden.
- **Syfte:** Identifiera vilka komponenter som är mest utsatta och analysera hur livslängden påverkas.
- **Metod:** Litteraturstudie, analys av historiska felrapporter, jämförelse med erfarenheter från andra flottor.

3. Reservdelsstrategi för en liten fordonsflotta

- **Kategori:** Fordon / underhåll / supply chain
- **Bakgrund:** X74-flottan består av få fordon, vilket gör att reservdelshantering är kritisk. Originaltillverkaren fasar dessutom ut vissa delar.
- **Syfte:** Utredda hur tillgängligheten kan säkras långsiktigt – exempelvis genom pooler, tredjepartsleverantörer eller livstidsinköp.
- **Metod:** Analys av kritiska komponenter, kartläggning av leverantörsmarknad, scenarier för olika strategier.

4. Retrofit-möjligheter för X74 – förlängd livslängd genom tekniska uppgraderingar

- **Kategori:** Fordon / konstruktion
- **Bakgrund:** X74 närmar sig mitten av sin livscykel och större uppgraderingar kan bli aktuella för att säkra konkurrenskraft och driftsäkerhet.
- **Syfte:** Identifiera möjliga tekniska åtgärder som kan förlänga livslängden med 10 år, exempelvis nya komponenter, material eller systemlösningar.
- **Metod:** Benchmark mot andra flottor, teknisk analys av befintlig design, scenarier för retrofit.

Har du idéer på eget tema för ditt examensarbete, kanske inom andra områden?
Du är varmt välkommen att skicka ditt förslag till:

erik.wennerholm@vrresa.se och julian.persson.thanapasya@vrresa.se

Master's Thesis Projects at VR Snabbtåg

1. Predictive maintenance for X74 – can we predict critical failures using operational data?

- **Category:** Rolling stock / maintenance
- **Background:** The X74 fleet is relatively small, and individual failures can quickly affect operations. Today, most maintenance is scheduled-based, but operational data and fault statistics are available.
- **Objective:** Investigate whether data analysis and machine learning can be used to predict failures of key components and thereby reduce unplanned stops.
- **Method:** Data extraction from train diagnostics, statistical analysis, and perhaps ML model. Compare actual failures with predictions.

2. Lifetime analysis of X74 components in Nordic climate

- **Category:** Rolling stock / maintenance
- **Background:** Winter conditions with cold, ice, and snow create challenges for high-speed trains not fully adapted to Nordic weather.
- **Objective:** Identify the most exposed components and analyse how their lifetime is affected.
- **Method:** Literature study, analysis of historical fault reports, and comparison with experiences from other fleets.

3. Spare parts strategy for a small Rolling Stock fleet

- **Category:** Rolling stock / maintenance / supply chain
- **Background:** The X74 fleet consists of few trainsets, which makes spare parts management critical. In addition, the original manufacturer is phasing out certain parts.
- **Objective:** Investigate how long-term availability can be ensured – e.g., through pools, third-party suppliers, or lifetime purchases.
- **Method:** Analysis of critical components, mapping of supplier market, scenario evaluation for different strategies.

4. Retrofit options for X74 – extending lifetime through technical upgrades

- **Category:** Rolling stock / maintenance / supply chain
- **Background:** The X74 fleet is approaching mid-life, and major upgrades may be required to secure competitiveness and reliability.
- **Objective:** Identify possible technical measures to extend the lifetime by 10 years, such as new components, materials, or system solutions.
- **Method:** Benchmark against other fleets, technical analysis of current design, scenario studies for retrofit solutions..

Do you have your own idea for a thesis project, perhaps in other areas?

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