Development platform for autonomous forestry machines

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Håkan Lideskog
Datorstödd maskinkonstruktion
Luleå tekniska universitet

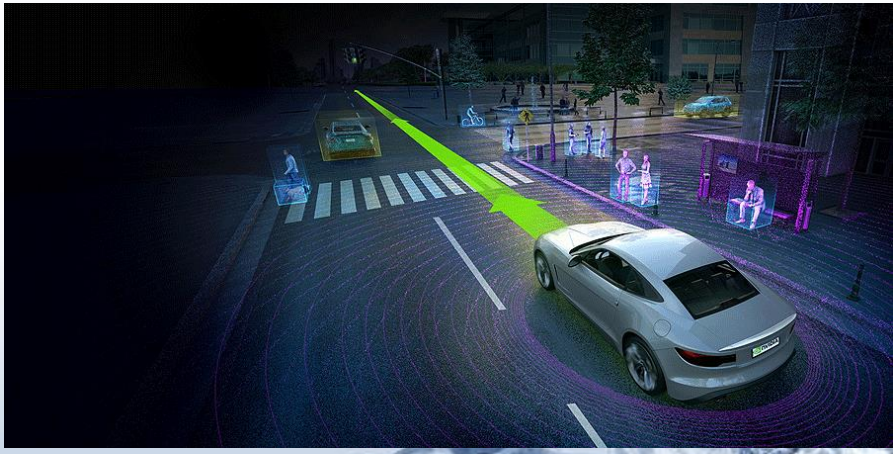
R&D in Forestry

- To use our R&D resources efficiently we need the prerequisites for a future scenario
- The biobased circular economy, what does that comprise?
- Efficient forestry R&D output depend on many things
  - Should we maximize profitability in value chains on sub-levels?
  - Should we minimize the ecological footprints? To what cost?
  - Who forms the political agenda? Politicians, product developers, forestry owners, wood refiners?

Other areas are doing it

Electric site

Autonomous drive



So why not (yet) in forestry?

- Development cost per vehicle is high
- Lack funding for large endeavours such as automation or semi-automation
- Companies rely on robust and well-recognized technology

Read more: Lideskog et al. (2015) Development of a Research Vehicle Platform to Improve Productivity and Value-extraction in Forestry. Procedia Cirp

Research focus strategy

- Uncertain future scenarios →
  - Focus on stand alone research questions with inherent value
  - Enable modular and flexible solutions

Research in Forestry

Harvesting and forwarding

- Navigation with optimised routes with respect to sustainable aspects, off-board and on-board
- Detect individual trees' biomaterial performance and respective positions
- New system solutions for increased biomass harvest

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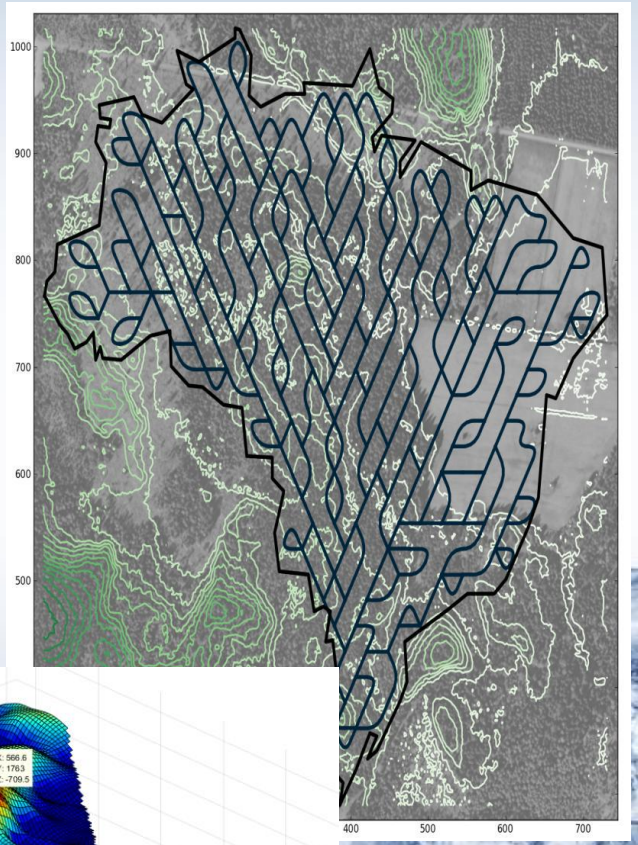
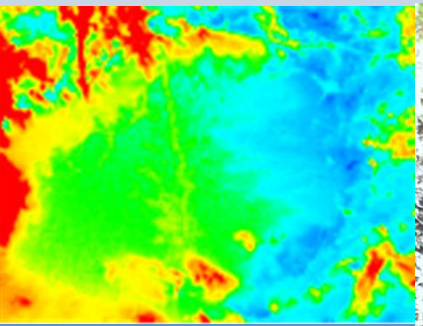
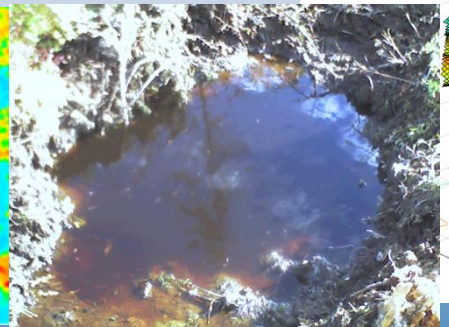
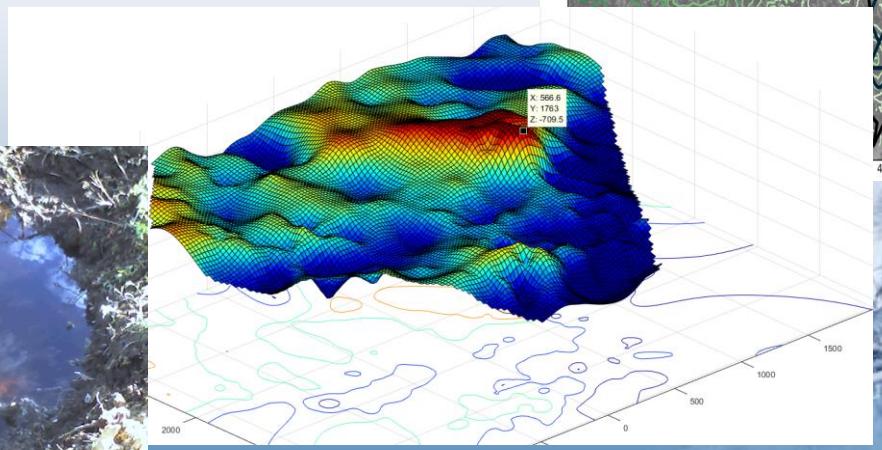
Example: Route planning for harvesting and forwarding

- ”Off-board” optimization with respect to economy and environment
- ”On-board” corrections with respect to
  - Soil properties
  - Inclination
  - etc.









Reforestation

Mounding

+

Manual planting

Disc trenching

Reforestation

Bracke Forest P11

M-Planter

Reforestation

- Navigation/route planning for continuous site preparation and planting
- Automation/Semiautomation of site preparation (and planting)
- Minimize soil impact from machine and equipment
- Address other eco-system services during operation
- Log data for future needs

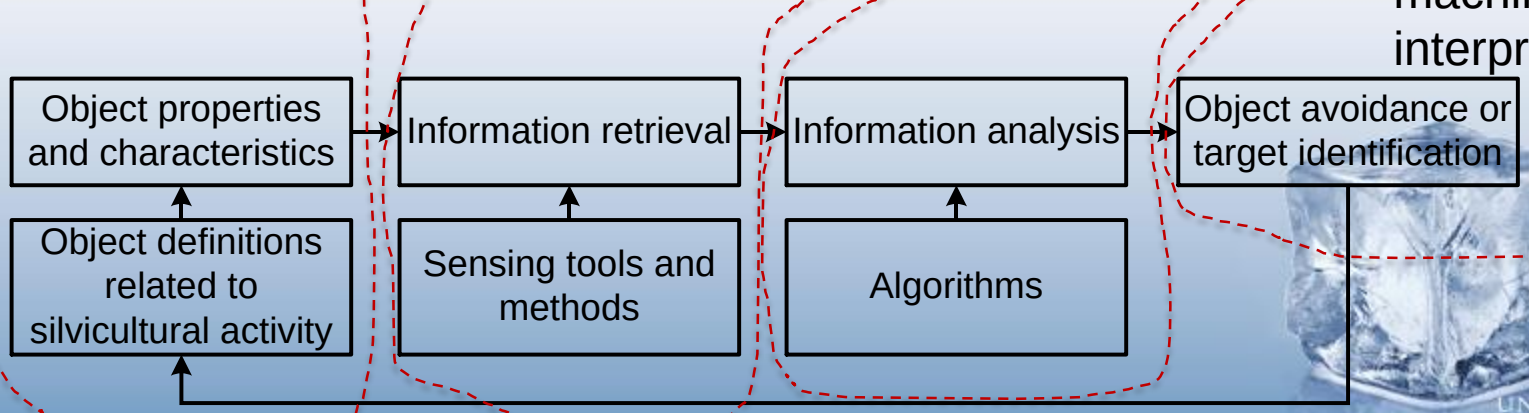
Sensing/Actuation Strategy

What needs to be identified?

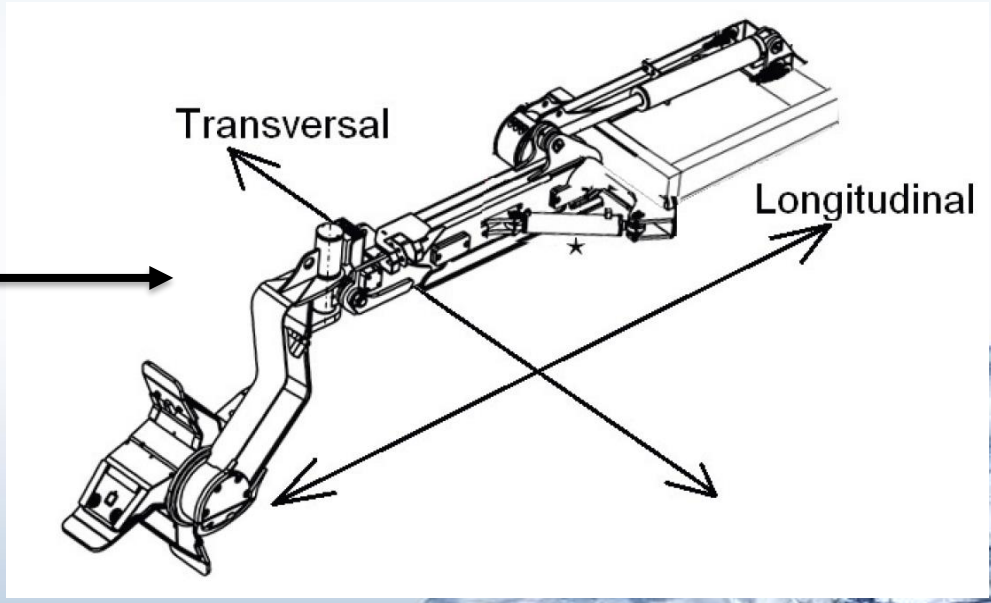
How to gather data for that purpose?

How to interpret that data?

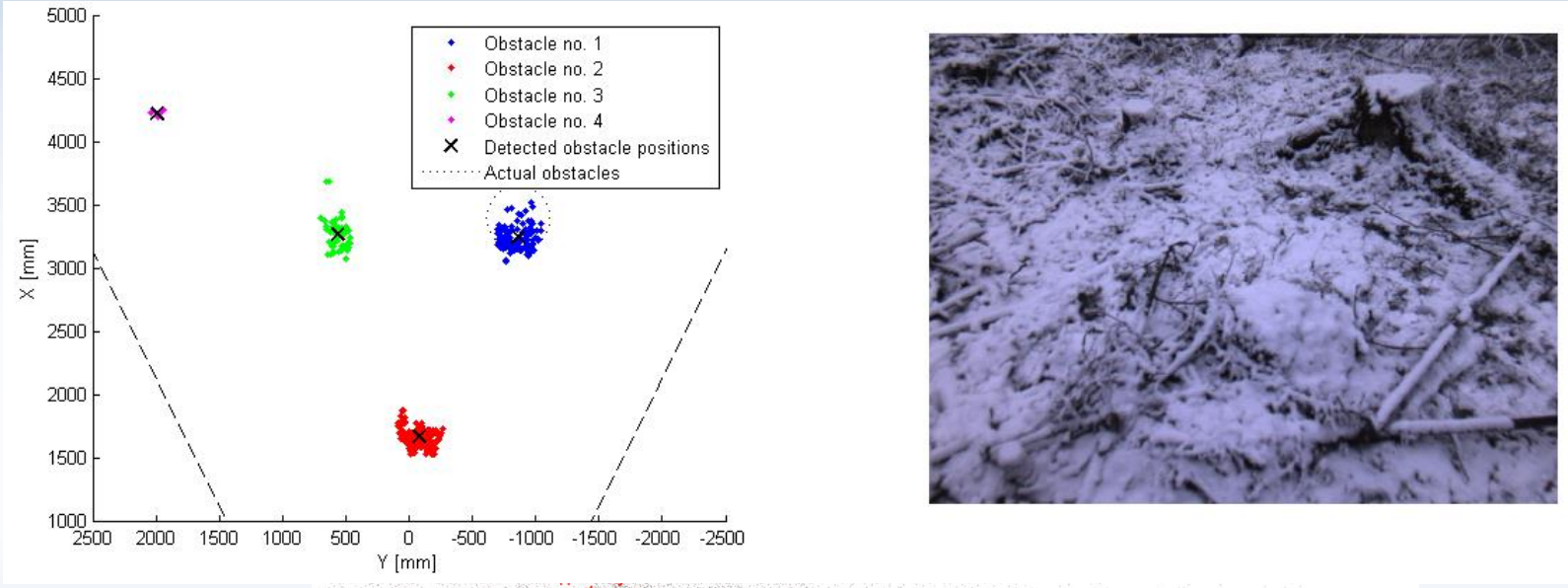
How to control the machine given the interpretation?



Example: Selective mounding

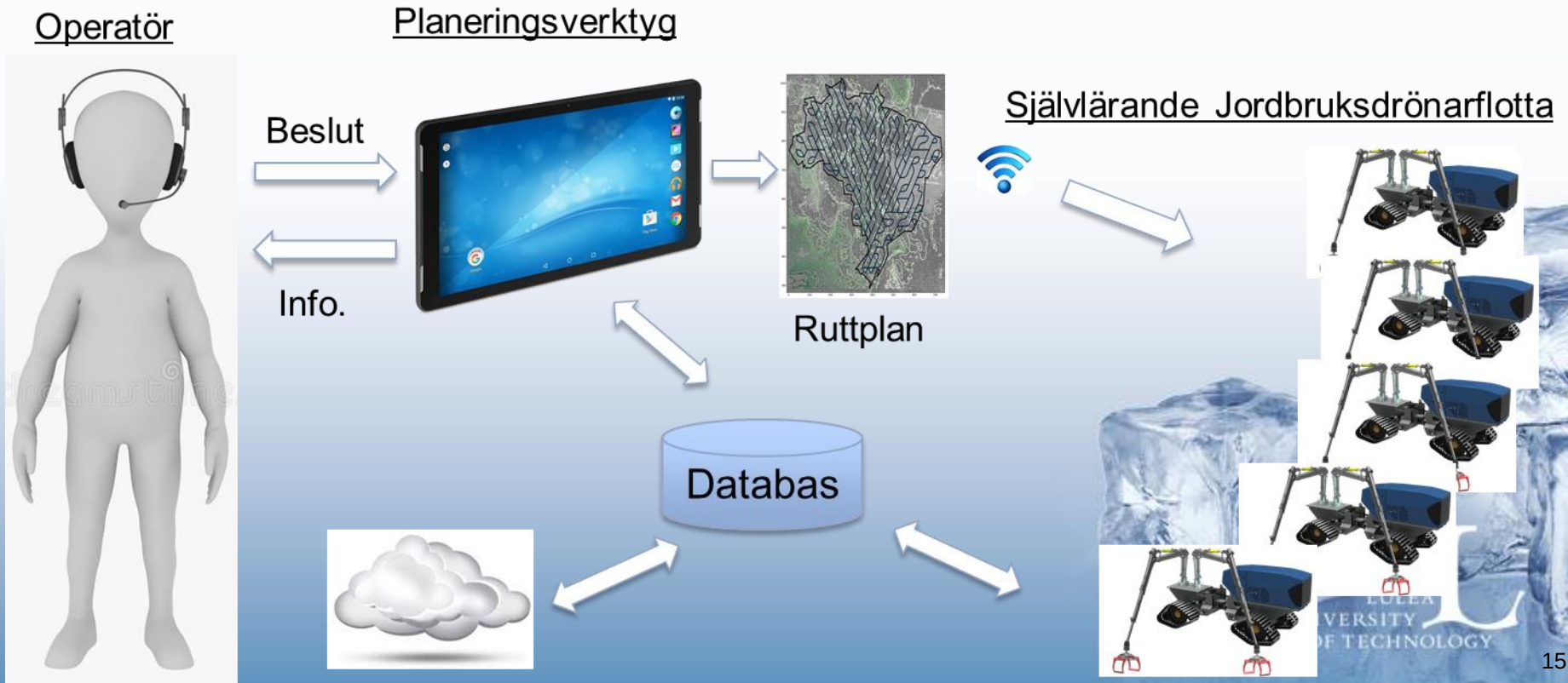


(Cont.) Selective mounding



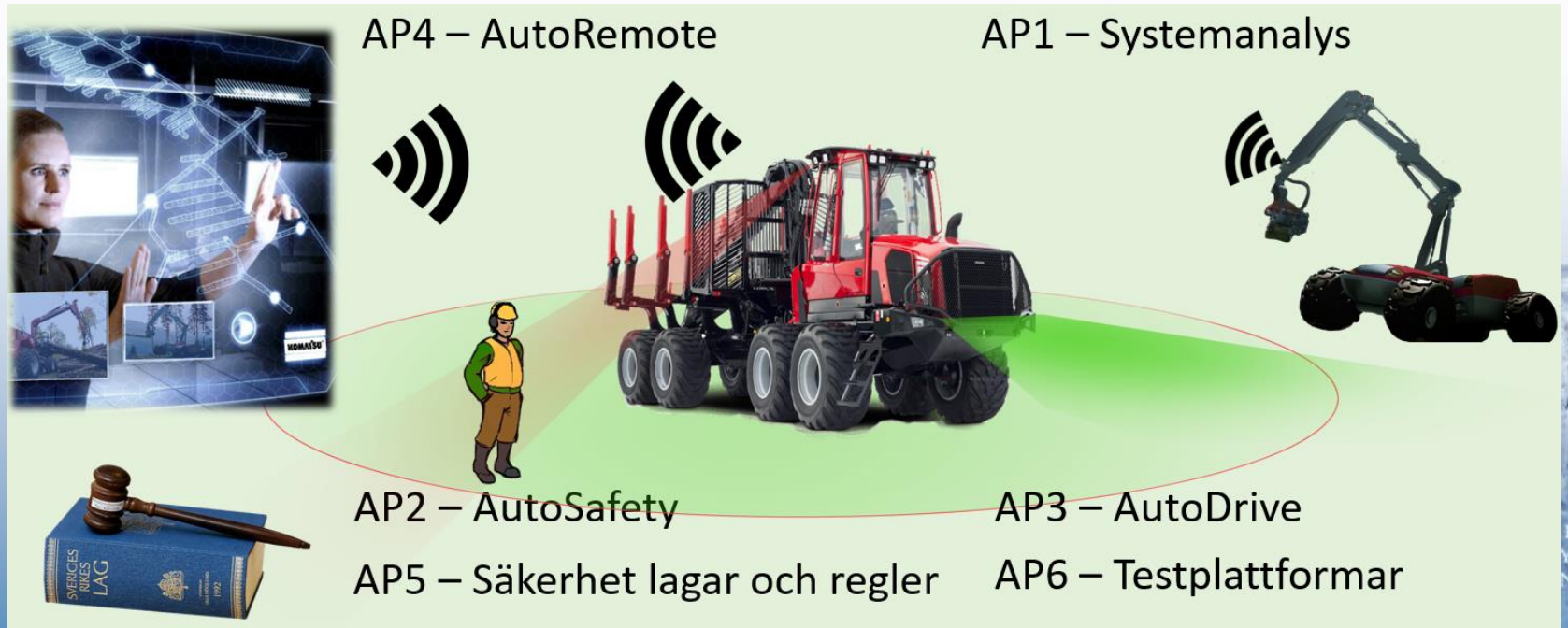
Example: Autonomous agricultural machine

Development of a self-learning system for autonomous route planning and navigation of agricultural machines



Example: Auto2

- Move the operators from machines to office-like working environments, encompassing:
  - Autodrive – Autonomous drive from A to B
  - Autosafety – Establish safety zone around machine
  - AutoRemote –Teleoperation and feedback to operators



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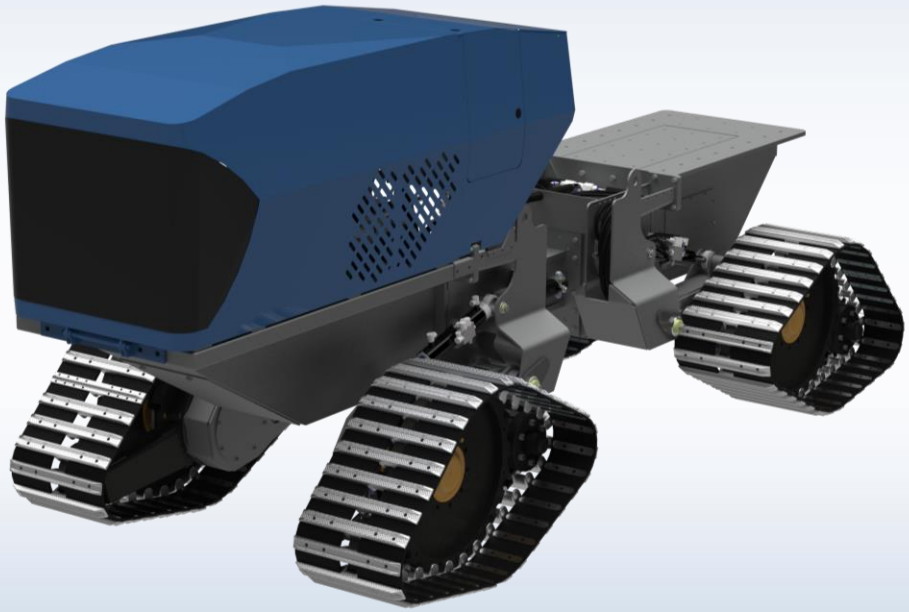

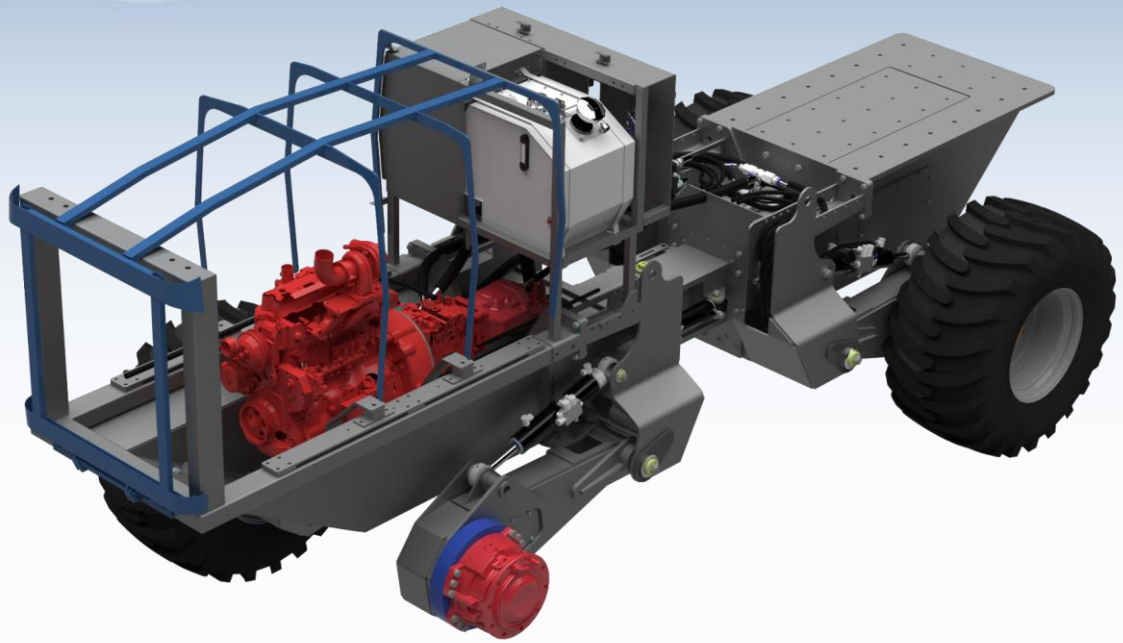

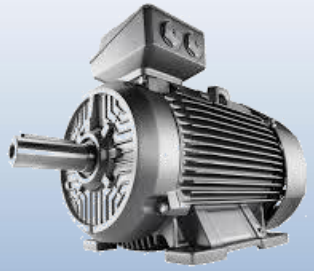

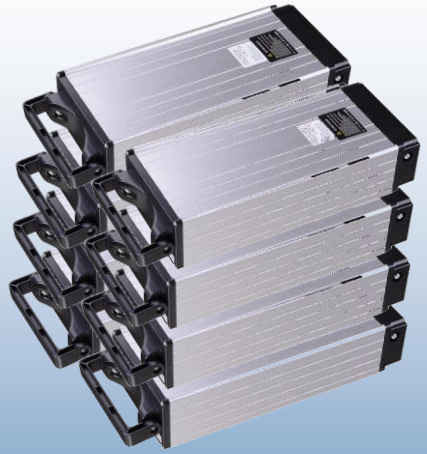

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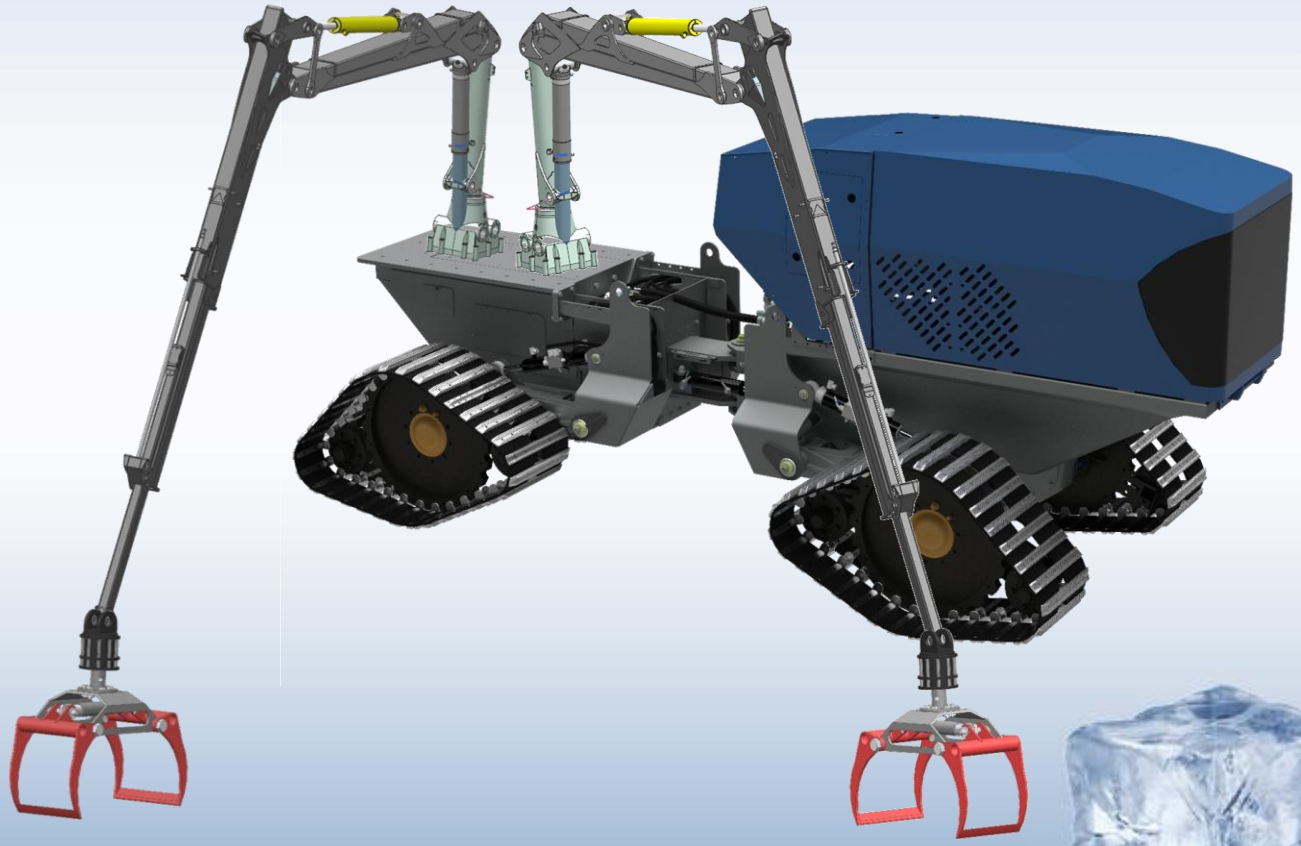

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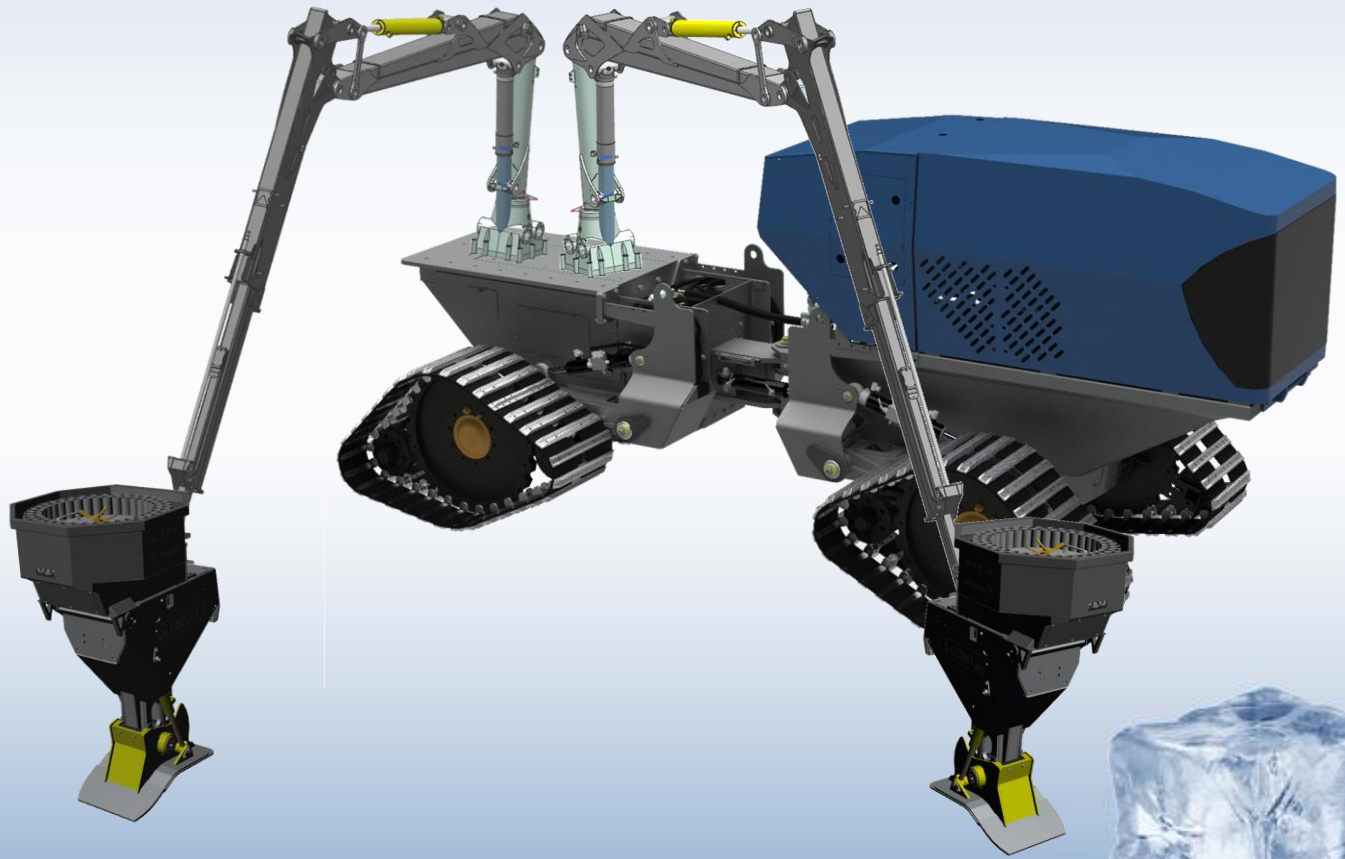

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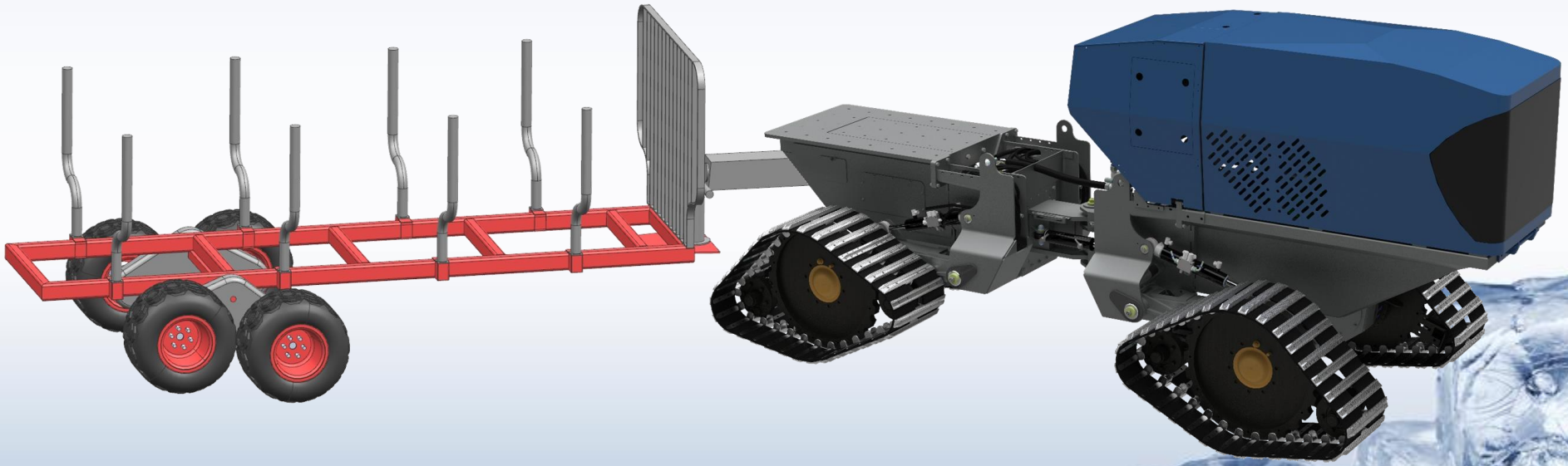

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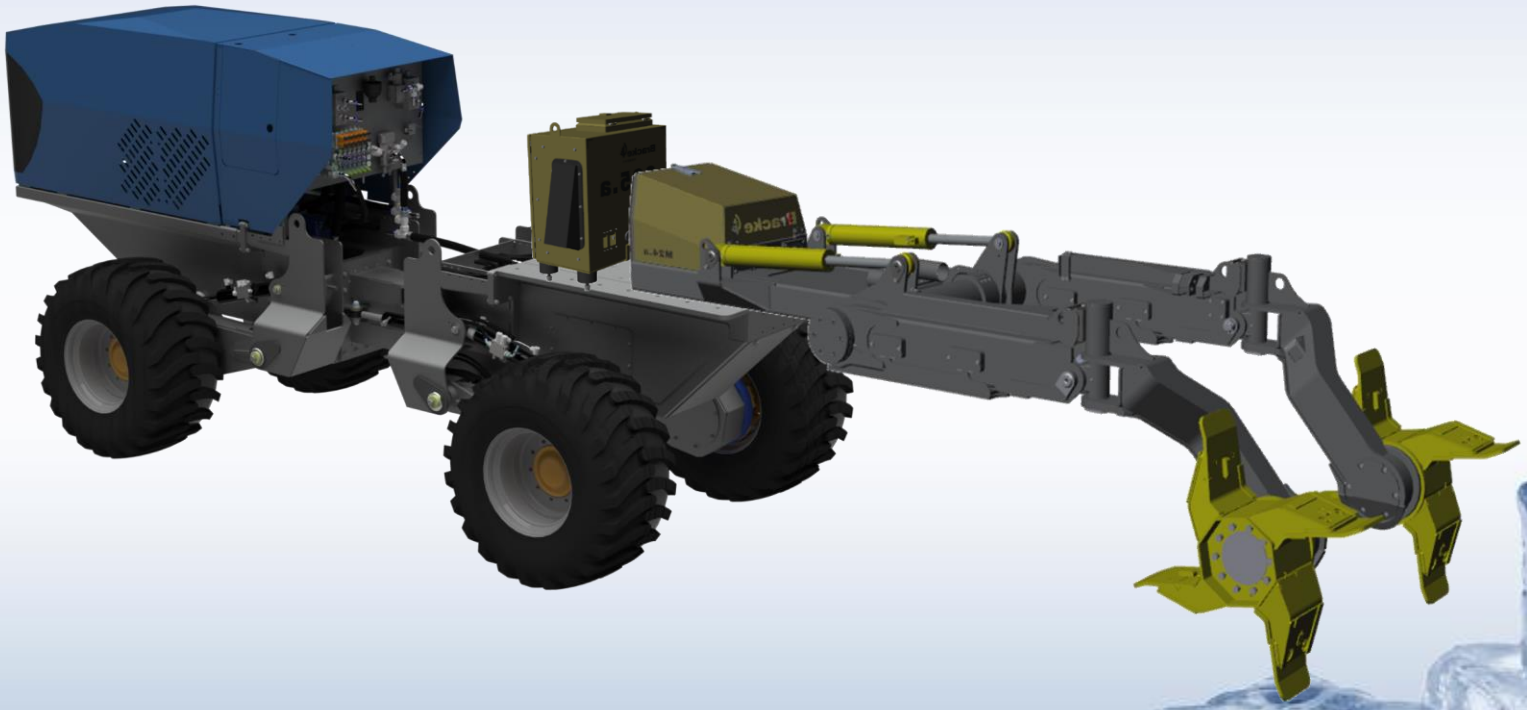

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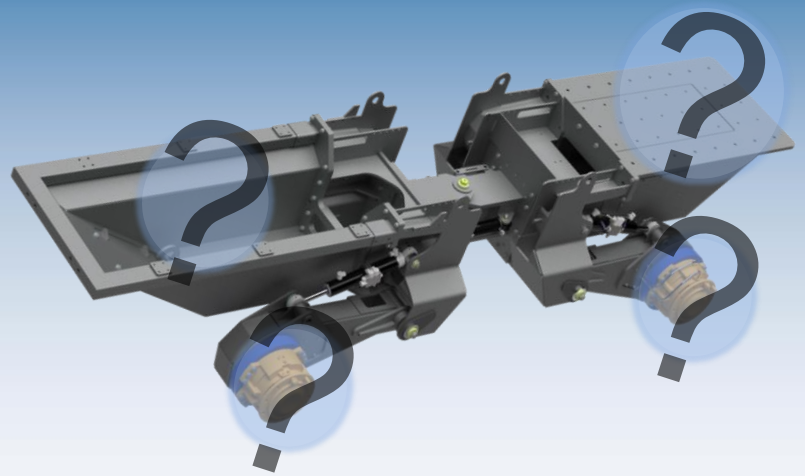

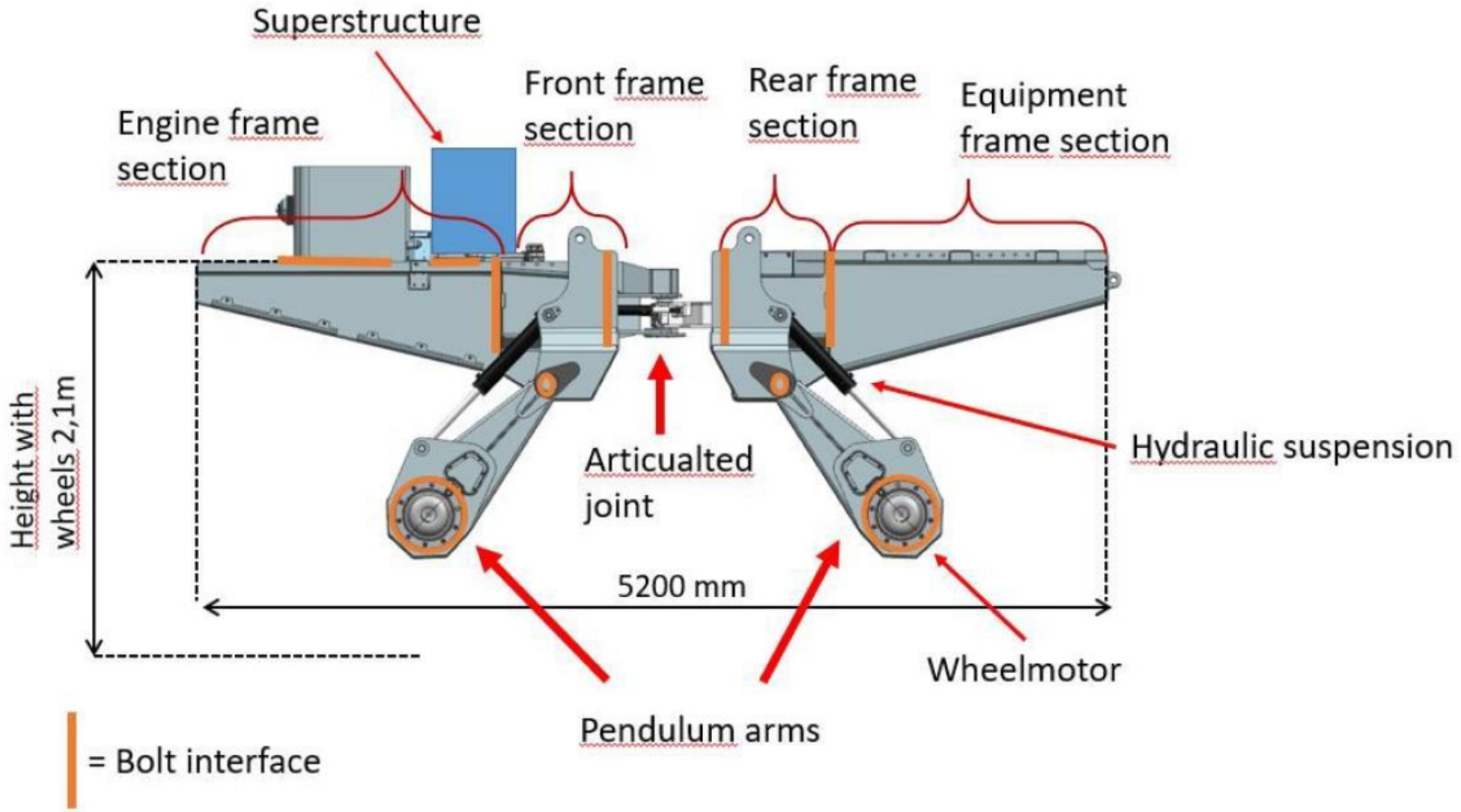
Superstructure
Engine frame section
Front frame section
Rear frame section
Equipment frame section
Height with wheels 2,1m
Articualted joint
Hydraulic suspension
5200 mm
Wheelmotor
Pendulum arms
= Bolt interface

Thanks!

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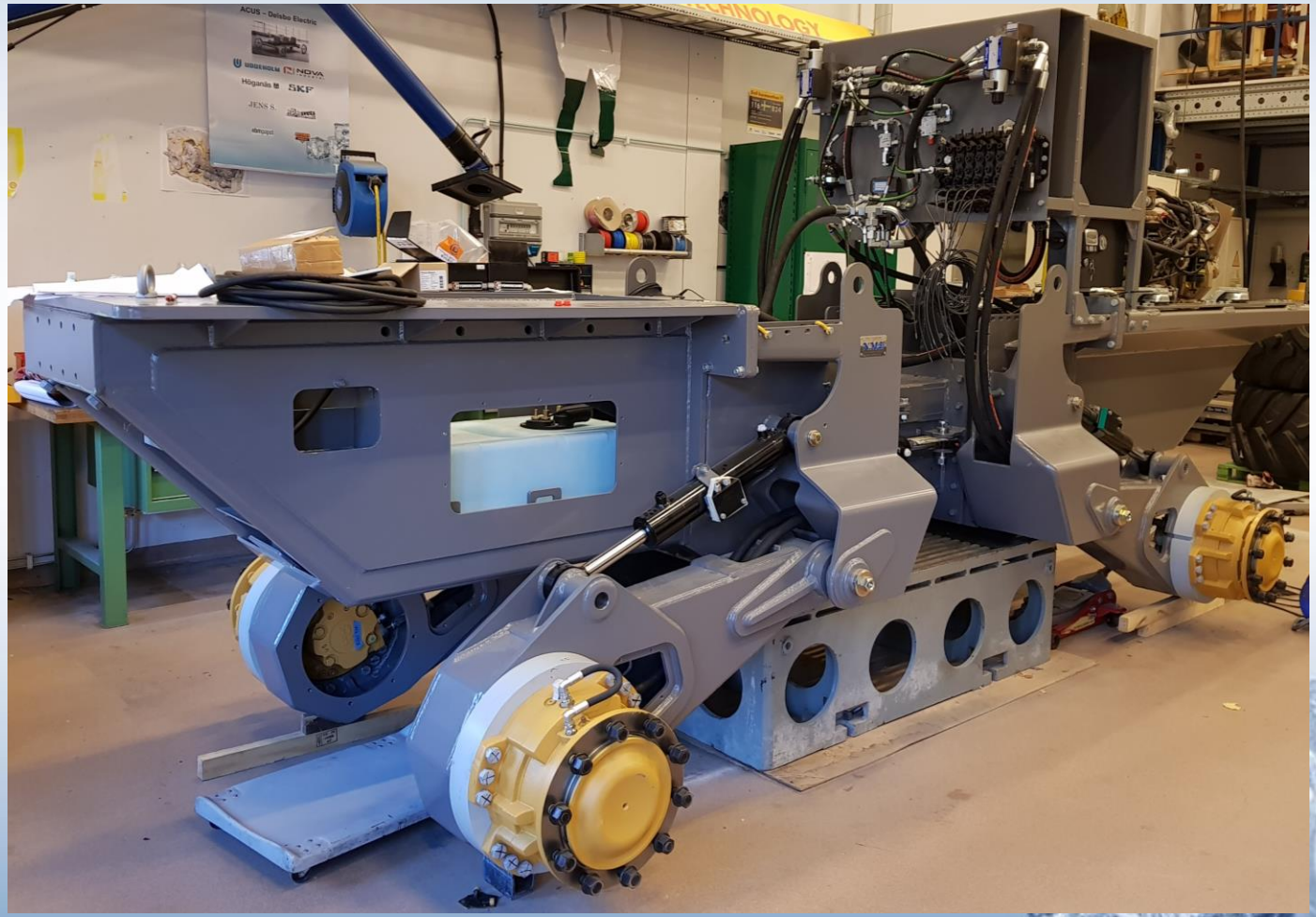

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