Background

- Yara is the world’s leading fertilizer company
- The factory at Herøya in Porsgrunn is the largest production unit for NPK fertilizer in Europe
- Yara is experiencing an increase in the volume of containers from the factory at Herøya
  - 40 000 truck loads each year
The Yara Birkeland Vessel

- The world's first electrical and autonomous container vessel
- L = 80m, B = 15 m, 120 TEU
- Zero-emission
- The vessel will carry fertilizer from Herøya to Brevik and Larvik
- Will be charged while mooring at Herøya
The Yara Birkeland Terminal

- Autonomous Crane and Straddle Carriers
  - 1 AutoRMG
  - 3 FSC
The Yara Birkeland Quay

- Demolition of the existing quay and surrounding warehouse buildings
- Construction of new quay and terminal area
The Yara Birkeland Quay

- Traditional open pile quay
- Crane beam in fill
- Crane legs c/c: 26.5 m
Quay Structures

- Pile foundations
Quay Structures

- Friction plates
Quay Structures

- Beams
Quay Structures

- Quay slab and transition plates
Quay Structures

- Concrete slab on fill
Quay Structures

- Mooring equipment
Quay Structures

- Reinforcement
Why drawingless design and construction?

- Forward-thinking solutions in forward-thinking project
- Norconsult wishes to be the leading consultant in Norway in drawingless design
- Our department of Port and Coastal Engineering has some previous experience from drawingless projects
- Norconsult suggested drawingless design and construction to Yara
- Drawingless construction was specified as a requirement in the tender documents and itemized in the BOQ for pricing
3D-model in BOQ
BIM software

- Structural and electrical components modelled in Revit
- IFC used for viewing models (open format requested by contractor)
- Solibri and StreamBIM used on site
Digital deliverables

- The deliverables from design office to site:
  - Viewing model in IFC format
  - PDF which contains general legend information
  - PDF with each version of the model with information about the current revision
  - Bar bending schedules are still in PDF-format
Benefits of model based design and construction in this project

- Adjacent structures: the structural elements are «constructed» in the model, hence making it easier to identify problem areas or conflicts.
- Restricted factory area: the model may be enriched with a level of detail not possible in 2D drawings. We have used the model to evaluate driving patterns and safety distances in the terminal.
- Late alterations to design: easier and quicker process when making design changes.
- Communicating complicated reinforcement design: easier in 3D than on 2D drawings, and all solutions must be thoroughly thought through by the designer — no cheating possible!
Challenges with model based design and construction in this project

- The model viewing software available for use on site is still not sufficiently good at extracting measurements and coordinates from model
- It is difficult getting everyone involved in the project proficient in the necessary software
- The different disciplines use different modelling software
- Generating and exporting the models takes time. One needs a sufficient time buffer from the final QC to the project deadlines to complete this work
Lessons learned

- It is important to specify set requirements to BIM knowledge within the contractor organization which can be evaluated in the procurement process.
- Collecting and updating a viewing model with input from many involved parties and in various file formats is a large part of the job and requires dedicated BIM coordinators.
- Some structural details are very hard to model, e.g. welds, concrete joints, etc. Find the required level of detail vs. time use necessary for your client.