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From production in a cellar to industry

How can small and medium sized businesses utilize advanced automation?

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Outline

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- Challenges
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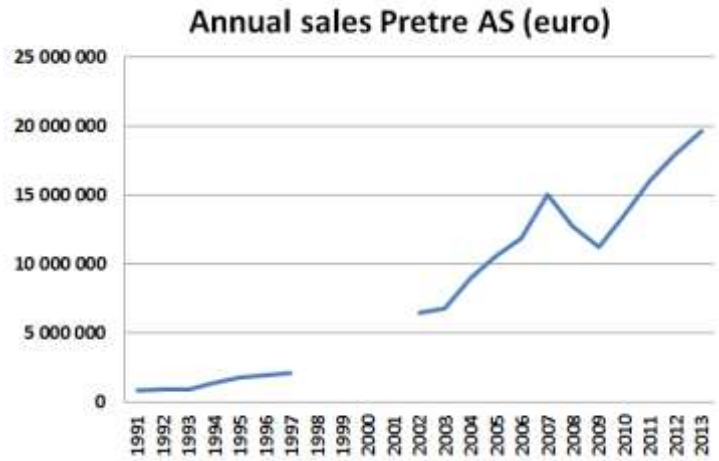
History of Pretre AS

- Founded by Gunnar Svarstad in 1976
- Cellar based production of standardized trusses
- Every little community had their own roof truss producer

- Started using computer aided construction of roof trusses in the mid 80s (first industrial milestone)
- Started using advanced NC-saws in 2005
- Installed the worlds first "fully" automated roof truss assembly line in 2011

- Pretre has four production locations in Norway, and in-house engineering located in Stryn.
- Pretre has a marked share of approx. 20% in Norway.
- Total market in Norway is approx. 8 million nodes pr. year.



Project background

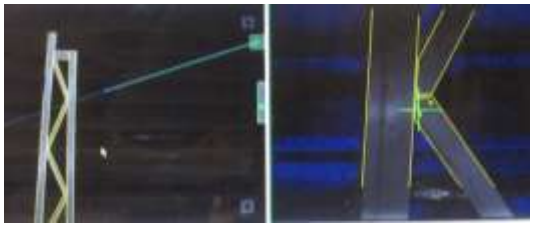
- Production methods (assembly) has more or less been unchanged since the start-up in the 1970s.
- No automated roof truss assembly equipment suited for Norwegian roof truss manufacturers was available in the world marked.
- Pretre used approx. 20 work minutes per nominal roof truss, and further reduction was difficult.

Challenges

- Pretre had limited experience with automation:
  - NC-saws
  - Laser projection of truss layout
  - Operators was used to manual assembly processes
- Every roof truss is potentially a unique design, meaning that the automated process needed automatic changeover capabilities.
- Large investment – approx. 9 MEUR.
- The required productivity increase was very high.
- Marked risk – the financial crisis of 2008 happened when the investment decision was about to be made.
- Pretre had to take a significant role in developing the new technology.

Project scope and requirements

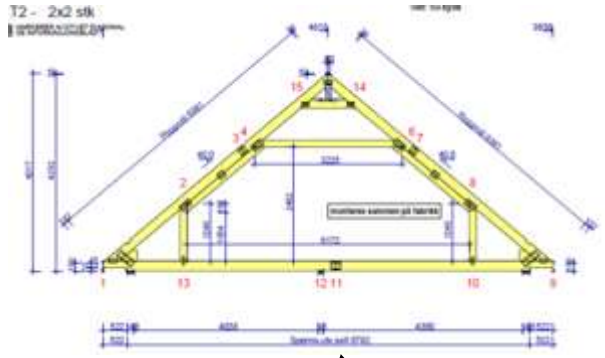
- Design of new factory for automated truss manufacturing – capacity calculations, selection of technology, investment analysis
- Conceptual development with system integrator
- Specification of equipment and follow-up of development, installation and start up on site
- Building, installation and start-up of factory

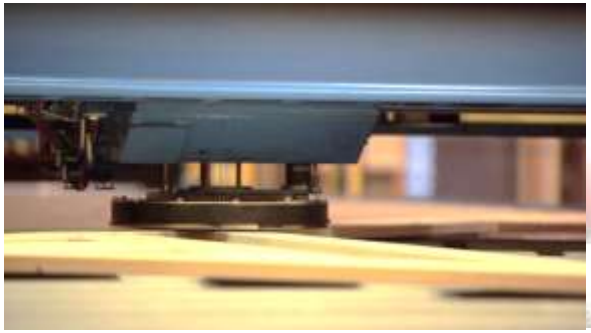


Requirements for the new factory:

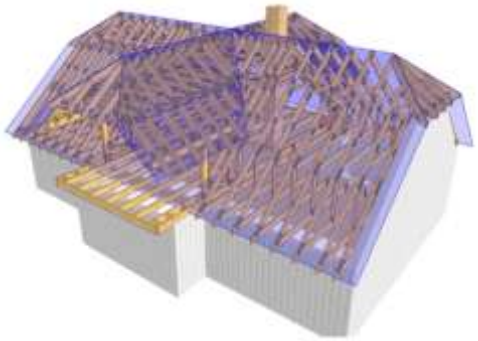
- Capacity should be approx. 800.000 nodes pr. year (100.000 nominal trusses)
- Productivity increase by 400%
- Flexibility to produce all truss designs up to size 12m x 4,2m, and material dimension of 36mm, 48mm and optionally 98mm
- Fully automated placing and pressing of nail plates
- Fully automated truss handling between stations (flow-line)
- Press force of 40 tons to ensure fully submerged nail plates

Roof truss production process



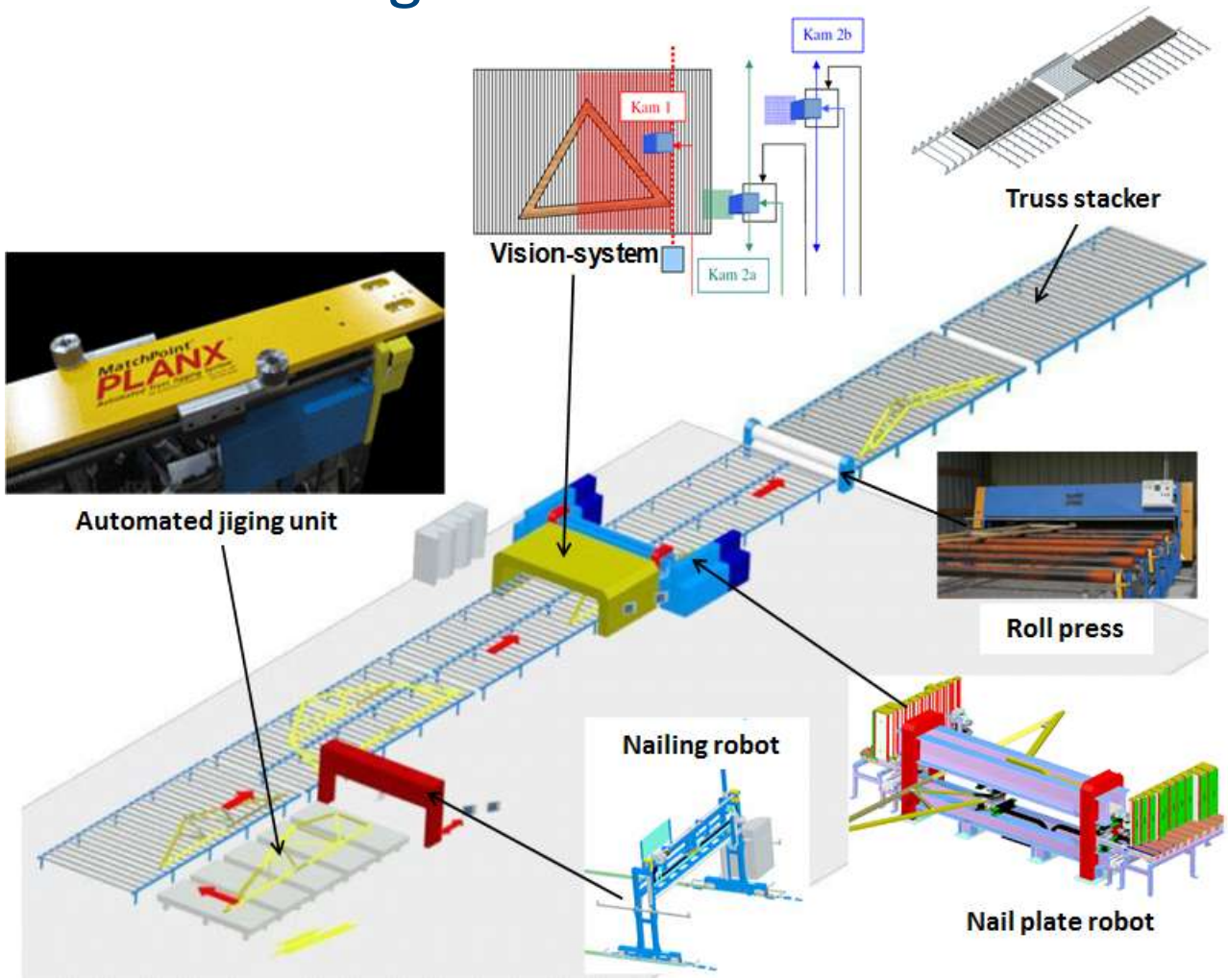


Engineering → Production data → Sawing → Pressing → Stacking → Delivery



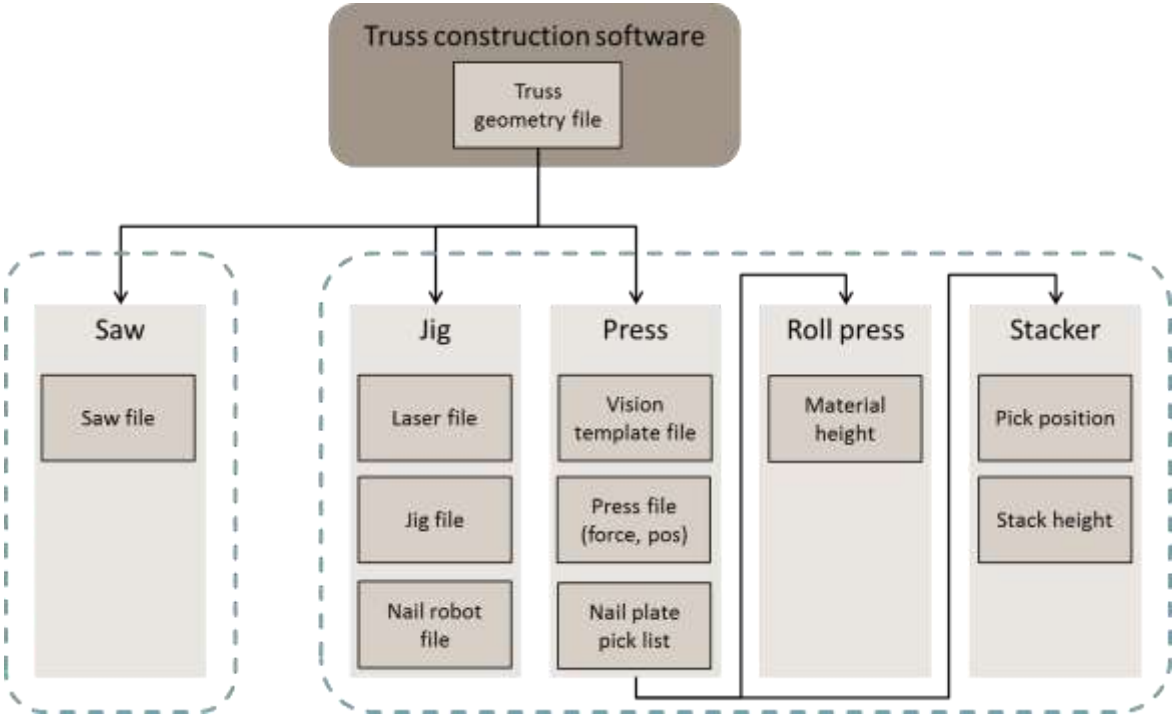
Technology for automated changeover

- The line was developed based on a mix of new and available technologies
- Key technologies
  - Automatic jig setup
  - Laser projection
  - Nail robot
  - Vision based positioning of nail plates
  - Nail plate feeding robot
  - Pressing robot
  - Roll press
  - Stacking machine



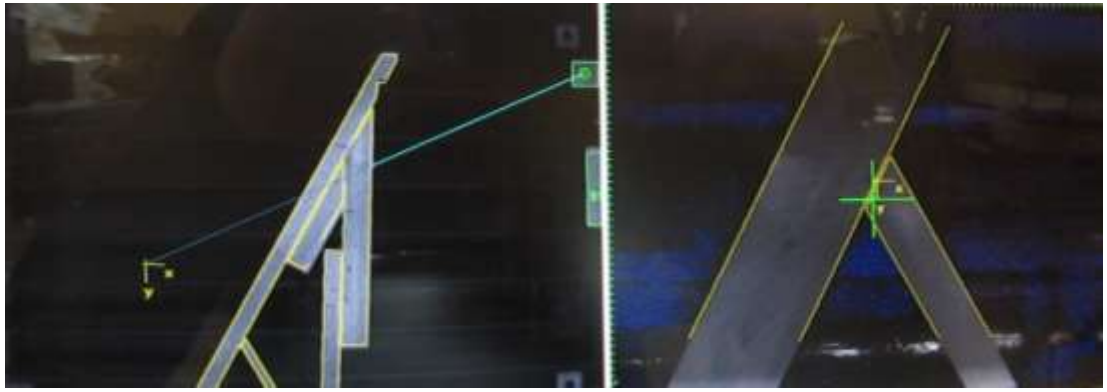
From construction to auto-programming of machines

- The key technology of the system is the capability to auto-program the machine
- The truss line is programmed based on exported files from the construction software



Vision based placing of nail plates

- Truss geometry and nail plate position known, but the position of the truss is not known
- The positioning tolerance is within a few millimetres
- The system uses 2 cameras to find the global and local nail plate position respectively
- Process:
  1. Vision template are generated from the design file
  2. Cam 1 locates the global position of the truss (bird view)
  3. Cam 2 locates the exact nail plate position and corrects the press target (3 DOF)



Concluding comments

- There is a great potential for automation in the wood and building industry
- It is possible for SMEs to utilize todays advanced automation technology
- Some important considerations are:
  - Finding the optimal level of automation
  - IT-infrastructure in the value chain is just as important as the equipment
  - Get involved in the development process
  - Training of operators and operative management is essential

Thank you for your attention.

Questions?