

PLACE FOR SUBTITLE

# Rapid prototyping and MBD

# Ponsse Plc



- **Ponsse is a forest machine company concentrating on sales, service, manufacturing and technology related to cut-to-length forest machines**
- Main markets: Finland, Sweden, Russia, Germany, France, North and Latin America
- Established 1970
- 12 subsidiaries and 32 dealers
- Employing globally 1 453 people (31.12.2016)
- Research and Development 3 % from total turnover and 4 % from new machine sales
- Turnover 517,4 MEUR, operating result 55,2 MEUR (2016)

## Our Strengths

- Clear ownership of the company, strong values and clear focus and direction
- Technology and knowhow in our own hands
- All forest machines manufactured in Vieremä and electronic manufactured by Epec Oy Seinäjoki
- The capability to change our products and operational business concepts based on the feedback and needs from our customers

77 %

of the machines are exported (2016)

1 453

Ponsse employees globally

46 %

of the R&D engineers are designing information systems

20 %

Share of the service business in turnover




# 22 Product Families

**PONSSE**

45 different patent families  
R&D & research investments  
since 2010: 66,8 MEUR



## THE PONSSE HARVESTER PRODUCT FAMILY

							
Model	Beaver	Fox	Scorpion	ScorpionKing	Ergo	Ergo 8w / ActiveFrame	Bear 8w
Power	150 kW	150 kW	EU: 210 kW Other countries: 205 kW	EU: 210 kW Other countries: 205 kW	EU: 210 kW Other countries: 205 kW	EU: 210 kW Other countries: 205 kW	EU: 260 kW Other countries: 240 kW
Harvester head	H5 or H6	H5 or H6	H5 or H6	H5, H6, H7, H7euca or H77euca	H6, H7, H7euca, H77euca or H8	H6, H7, H7euca, H77euca or H8	H7, H8 or H8 top saw
Crane	C2 or C44+	C44+	C50	C50	C5 or C44+	C5 or C44+	C6 or C55
Special features	A versatile, all-round machine from first thinning to regeneration felling.	An agile eight-wheeler for difficult terrain and soft harvesting conditions.	A next-generation harvester designed with the driver and the environment in mind.	The best stability and ergonomics on the market added with the excellent performance of the double-circuit hydraulics.	The most powerful all-round machine in its size category: equipped with double-circuit hydraulics.	An extremely powerful eight-wheeler equipped with double-circuit hydraulics and capable of performing even in the most challenging terrain.	An eight-wheel powerhouse for heavy-duty harvesting.

## THE PONSSE FORWARDER PRODUCT FAMILY

								
Model	Gazelle	Wisent	Elk	Buffalo/ ActiveFrame	BuffaloKing	Elephant / ActiveFrame	ElephantKing / ActiveFrame	BuffaloDual
Power	150 kW	150 kW	150 kW	EU: 210 kW Other countries: 205 kW	EU: 210 kW Other countries: 205 kW	EU: 210 kW Other countries: 205 kW	EU: 210 kW Other countries: 205 kW	EU: 210 kW Other countries: 205 kW
Load carrying capacity	10 000 kg	12 000 kg	13 000 kg	14 000 kg (15 000 kg)*	18 000 kg	18 000 kg	20 000 kg	14 000 kg
Loader	K70+	K70+	K70+ tai K90+	K90+ tai K100+	K100+	K100+	K100+	K90Dual+ / H5
Special features	A lightweight, agile and economical forwarder. Available in 8-wheeler.	A powerful all-round forwarder. Available in 8- and 10-wheeler.	The most powerful forwarder in its size category. Available in 6-, 8- and 10-wheeler.	The new champion on forwarders. Available in 6-, 8- and 10-wheeler. ActiveFrame: only in 8-wheeler.	The king-size carrier of heavy loads. Available in 6- and 8-wheeler.	A great, load carrying capacity and superior tractive force. Available in 8-wheeler.	Superior carrying capacity and tractive force. Available in 8-wheeler.	A multi-purpose machine. Available in 8-wheeler.



\* with balanced bogies

# Background of MBD

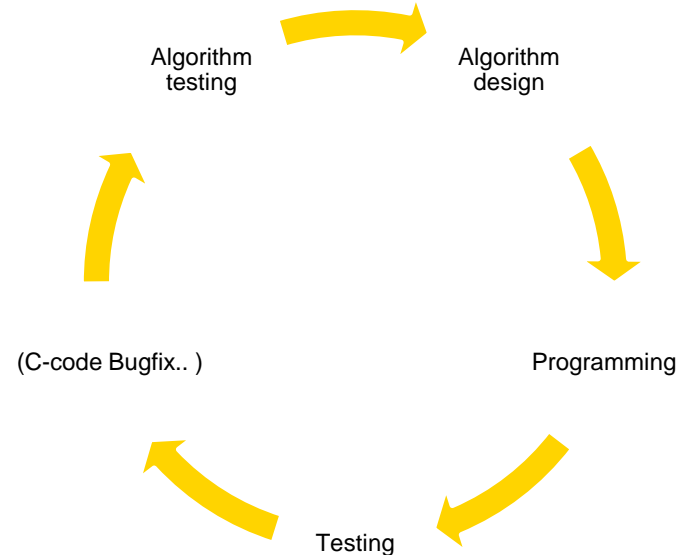
- Model based design have been part of our development almost a decade for now.
- First touch to Mathworks products was algorithm development with Matlab
  - Matlab algorithms was converted to C-code manually
- At the beginning only one developer was actively using Matlab
- Matlab, Simulink and stateflow are used in several production models

# Background of MBD

- Simulation environment of simulink has been in use at long time
- In most cases Model based designs has been prototyped with Speedgoat environment.
- After Speedgoat testing models are integrated to Ponsse ECUs
  - Code Generation with embedded coder

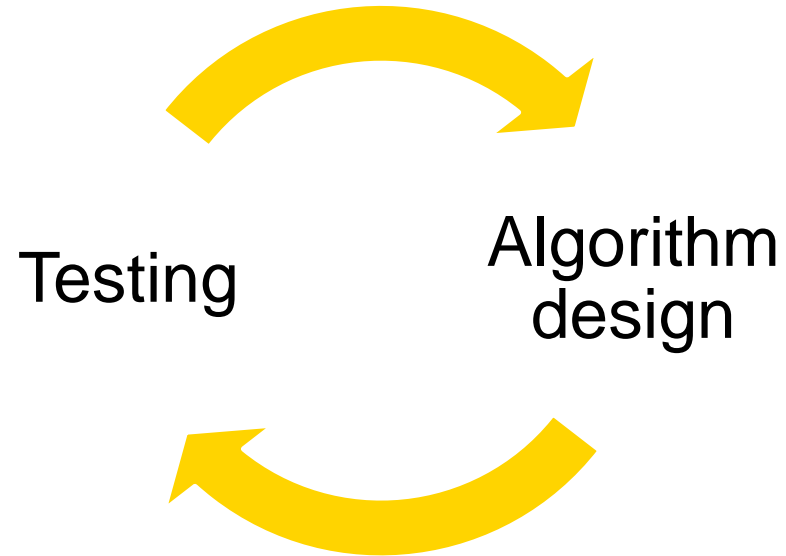
# Traditional prototyping

- Before MBD and prototyping was made with Ponsse ECU:s and C-language
- Long process before algorithm can actually be tested
- C-code writing can be quite tricky
- Mistakes are obvious
- Slow process



# Rapid prototyping

- Algorithm design with Simulink/Matlab
- Direct use of SpeedGoat
- Algorithms can be tested instantly
- No manual coding work → less errors
- Designer can really concentrate to algorithms instead of programming



# Case Scorpion



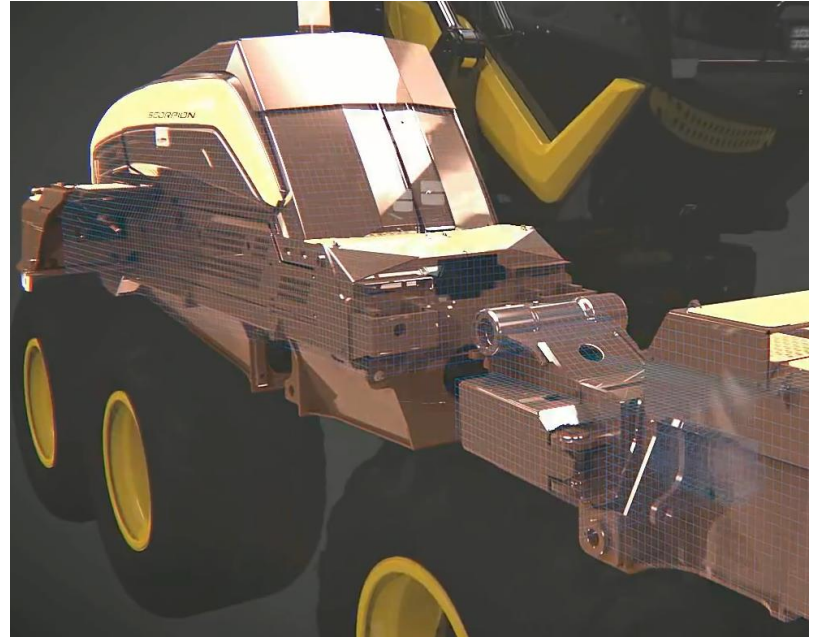


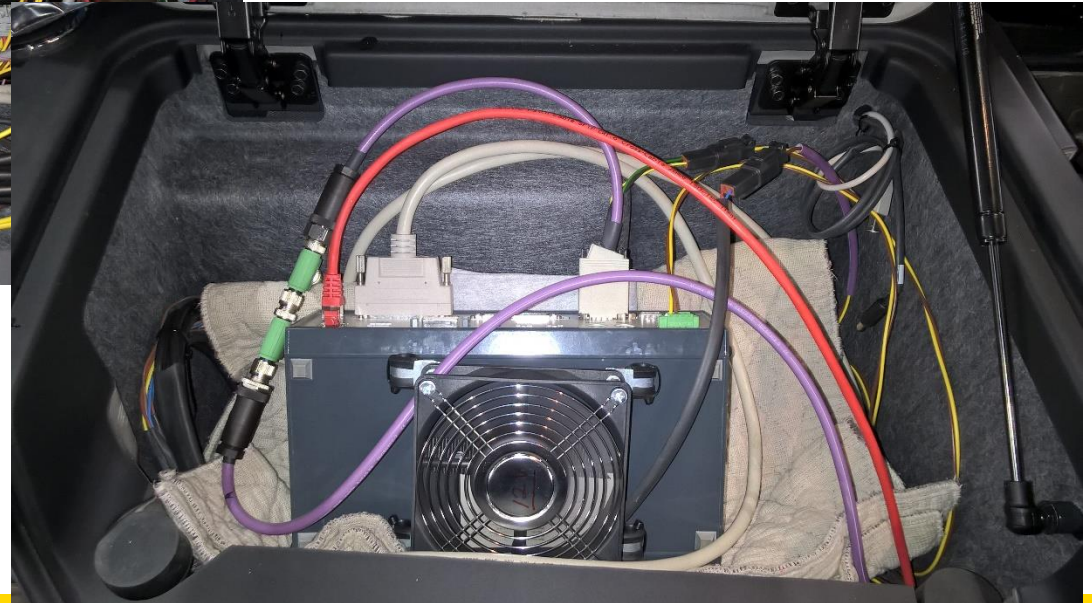
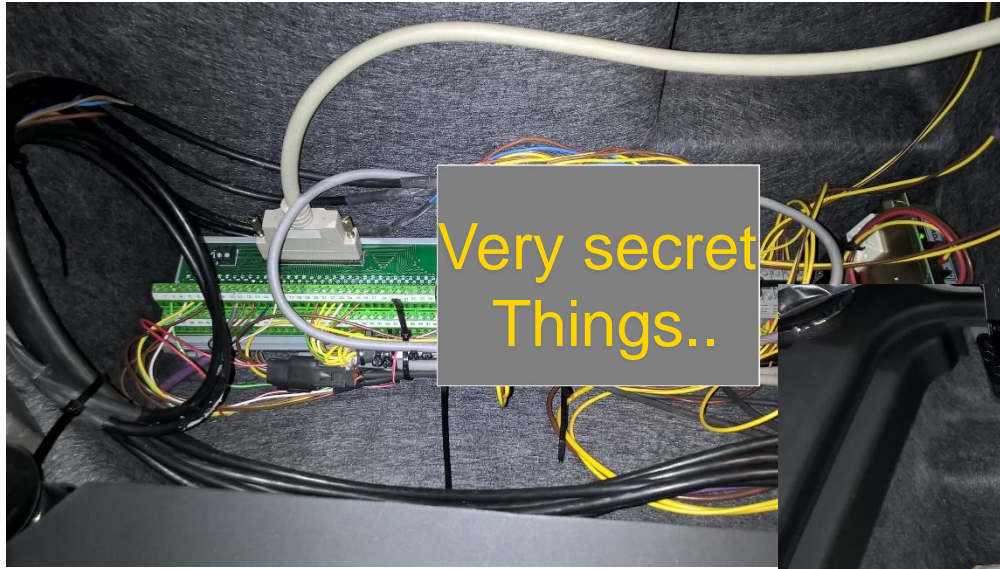
# Case Scorpion

- In this project whole machine was designed almost from zero
  - Completely new mechanical design
  - New electrical design
  - New embedded controllers for levelling system were also developed during project
  - First big project with Simulink
  - First fully working prototype was created less than a year

# Case Scorpion

- Scorpion stabilization control was developed with Matlab and Simulink
- First steps were made with Simulink simulation environment
- After successful simulation algorithm testing continued with SpeedGoat environment
  - About a year testing and tuning with speedgoat as an leveling controller in machine





# Case Scorpion

- After SpeedGoat testing algorithms were generated to C-code for new control unit
- Integration with new control unit
  - Hardware base layer were made with C-language
- Several months of testing were also made with real control units
- Performance measurements with real target HW





# Traditional vs. Rapid

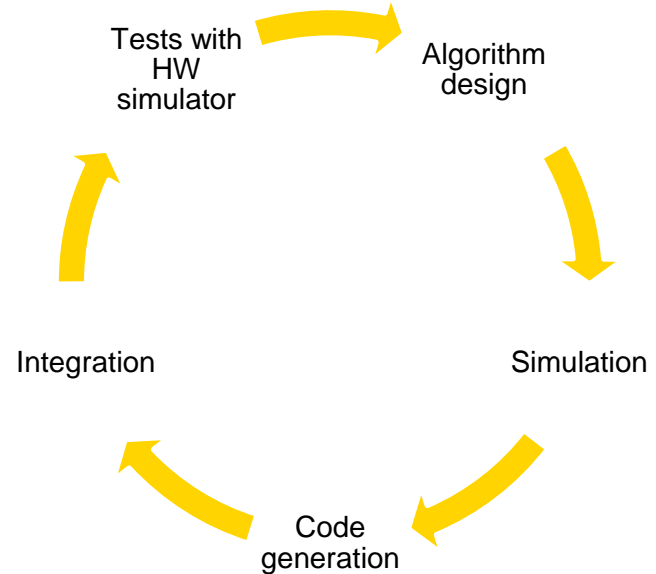
- Really fast algorithm design
- Designer can really concentrate to algorithms
- Good integration to control HW(Speedgoat)
- Testing of algorithms is possible with minimum changes to machine control system
- Good control opportunities of target RT-HW with toolboxes
- Good quality of algorithm can be achieved in short time
- Generated code works with little effort

# Everyday MBD

- At the moment Model Based Design is in use at several projects
- Development is basically made same way like with SpeedGoat
- After simulation in Simulink software is tested in HW simulation environment
  - At the moment code is generated and integrated to controller before HW simulator tests
  - PIL- test are executed for models with target controllers

# Model based methods

- Algorithm design with Simulink/Matlab
- Algorithm simulation
- Algorithms integration with legacy code
- No manual coding work → less errors
- Designer can really concentrate to algorithms instead of programming







# Benefits of MBD

- Faster than traditional way
  - Less costs
  - Some cases over 50% shorter development time
- Less hand written code needed
  - Better quality
  - Less man made errors



# Summary

- **Rapid prototyping speeds up designing**
  - Shorter development times → decreases development costs
  - Generated code is quite reliable
- **MBD speeds up design time**
  - Less man made bugs
- **Needs quite lot of learning at the beginning**
- **Little bit pricy licenses**
- **Toolboxing**

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# A logger's best friend

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