Developing a new yarder-controlled mechanical slack-pulling carriage for double-drum winches

The Norwegian Forest and Landscape Institute

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1986 Igland A/S Wildcat (hydraulic system)
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2009 Mecano prototyp Mechanical
> 1986 Igland A/S  →  Wildcat (hydraulic system)
> 2009 Mecano™ prototyp  →  Mechanical
> 2010 From Idea  →  Design
                      →  Construction
                      →  Assembly
                      →  Testing
• The material and construction of prototype carriage must tolerate falling 5 m without functional failure.

• Material must be decided on in cooperation with the constructor. Especially the advantages of lightweight alloys over steel, but the ease of repairing steel in remote workshops.

• There must be horizontal distance between mainline and haul-back line to avoid twist.

• Carriage must be operated by wireless remote control.

• Shifting operation from slack-pulling to travelling by hydraulic or electric actuator

• Speed of skid line ca. 1m/sec

• It should be easy to mount lines on carriage.

• Colours - should be orange with black on capstan for good visibility
The final design and construction was outsourced to the same consulting engineer that constructed the Owren 400 mini-yarder.

There were many challenges, meetings and discussions during the construction phase.

Laser cutting and welding of the chassis was also outsourced, leaving only mounting and painting to be completed by the institute workshop.
System

- Mechanical system with planetary gear inside
- Two solenoids engages either the skidding line cog or the travelling cog by wireless remote control
- The carriage has two capstans; one for the mainline, and one for haul-back line.
Assembly of carriage
1:3 scale mechanical slack-pulling carriage undergoing testing
Testdriving with Owren 400 mini.
Results of initial testing

> Balance in carriage was incorrect, and two metal bars had to be attached to the swing-arm as ballast.

> Adjustments on shifting arms.

> Beginning of June numerous tests were done, modifications were necessary to the planetary gear.

> By the middle of June the carriage was working according to expectation. In a run of 15 cycles requiring 30 shifts between the travelling and slack-pulling gear, only 2 malfunctioned.

> The most significant problem has been slippage on the driving gear when the switching arm does not engage in a synchronized way.

> Testing to date has only been carried out on 10% slope.

> Further tests, will be done on 20 and 30%.
Conclusion

> More development is necessary
  > Cog wheel?
  > brake disc?
  > lock plunger?

> We will succeed in developing a new yarder-controlled mechanical slack-pulling carriage for double-drum winches.
Thank you