

IK®



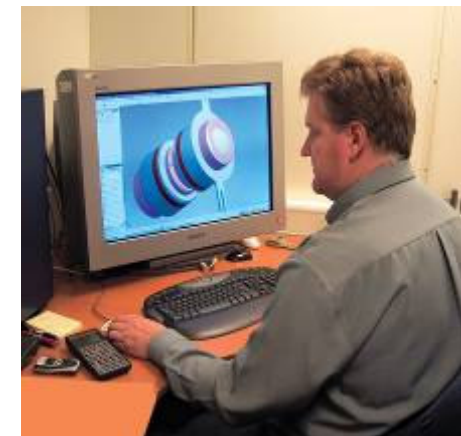
## Vision

**IK shall be a supplier of niche services and products related to pipe and pipelines. IK shall serve as a problem-solver for our clients whilst supplying efficiency and quality of works at all times.**



## About IK

- **Founded in 1987**
- **Head quarter Fabrikkveien 21, Forus, Stavanger**
- **High quality offices, workshop, ware house and calibration laboratory.**
- **State of the art 3-D CAD, FEM, Autodesk Inventor and Ansys Workbench**





# Thunder Horse

- Largest moored [semi-sub. oil platform](#) in the world
- located in 1,920 [metres](#) of water
- About 241 [km](#) southeast of [New Orleans, Louisiana](#) in the [Gulf of Mexico](#).
- Thunder Horse was delivered in 2004



# Thunder Horse

- In July [2005](#), Thunder Horse was evacuated in the face of [Hurricane Dennis](#).
- The platform was fully righted about a week after Hurricane Dennis
- The platform was struck almost directly by [Hurricane Katrina](#) six weeks later, but was not heavily damaged.



# Thunder Horse in 2004 on MV Blue Marlin





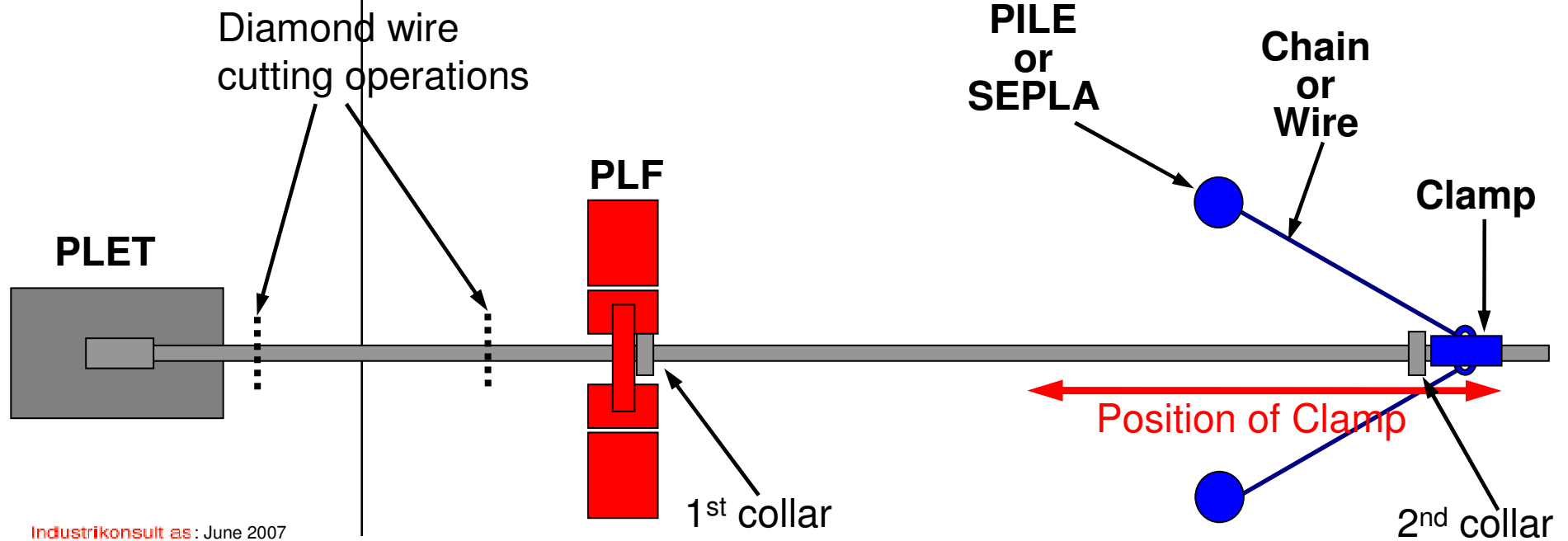
## Thunder Horse with the Balder, Thialf and *Discoverer Enterprise* in the background





## Clamp around SCR near 2<sup>nd</sup> collar

- Alt. a) Friction based with interface at coating
- Alt. b) Bearing based (bite into coating)
- Alt. c) Collar based (load transferred into collar)







## Dimensions / Design Loads

<u>Pipe</u>	<u>SWL</u>	<u>Design load</u>
12"	211 kips	411 kips
10"	151 kips	294 kips
8"	129 kips	252 kips



## Challenges

- 2000MSW
- Thermotite coated Pipes
- Skew load
- Holding period of 6 months
- Installation and recovery
- Environment → relative strong currents



## Design solution

- Friction based, not regarded as proven technology
- Collar based, insufficient capacity ( plastic )
- Bearing based, proved technology

Hydraulic operated metal teeth with slips



# Coating Capacity Issues

- Sufficient teeth intrusion into the coating
- Not teeth penetration
- Outer layer mechanical capacity
- Internal layers shear capacities



## Coating after Full Pull





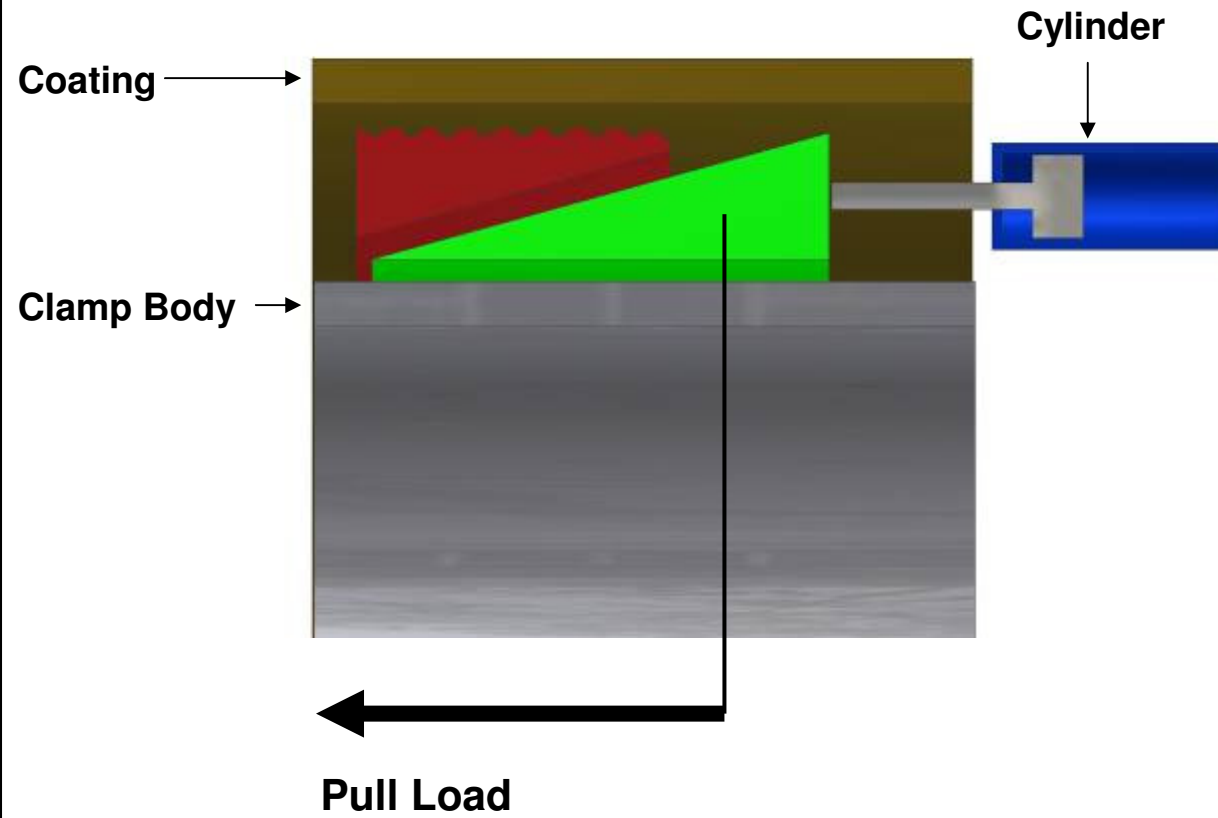
## Coating Capacity

- Correct teeth angel
- Correct depth off the teeth
- Correct slips angel
- Sufficient number / length of teeth
- Correct pre-setting load

**Documented by empirical formulaes and testing**



# Basis Design





# Slips concept

Thermotite coated pipe

Slips with teeth, 40 off in total

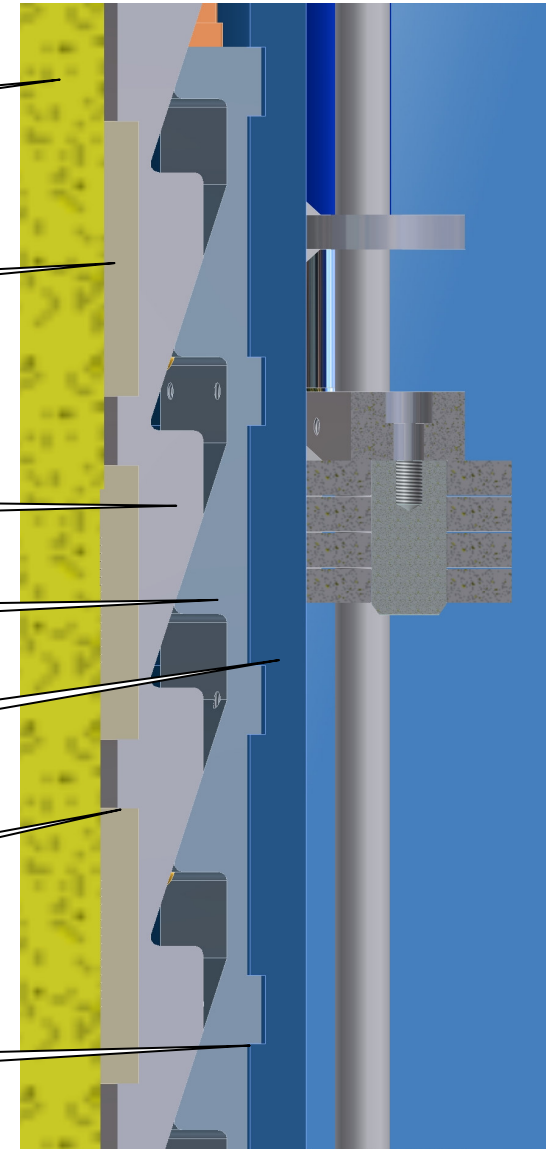
Slips holder plate 10 off

Bowl plate, 10 off

Clamp body, 2 halfes

Ring for axial load transfer

Ring for axial load transfer







## Presetting of Teeth

- Keep pressure stable for 6 months operation
- To be lifted to surface and lowered during operation
- 200 bar from ROV

0-leakage check valves.

350 bar hydraulic intensifier

Accumulator



# HBC Running Tool





## Testing

- **Complete function test at 2000 meter pressure.**
- **Cycle testing, 30 cycles per hour for 24 hours.**
- **Full load testing for 24 hours.**
- **Full load on one lift lug only.**



# Hold Back Clamp m/ Test Tool





# Testing til 2000MSW







## Test Rig with Hold Back Clamp





# Ready for Delivery







## Ready for Boxing

