MacGregor FibreTrac Crane

Combining proven technologies to realize a NEW tool

Scott Garriott
MacGregor services and solutions for Merchant Ship and Offshore segments

- Hatch covers, container lashings
- Cranes
- RoRo access equipment
- Port and terminal solutions
- Marine selfunloaders
- Offshore load handling
- Fishery and research
- Deck machinery
- Steering gear
- Mooring systems
- Offloading systems
- Bow loading systems
Load Handling Solutions

- The LHS business unit provides essential load handling equipment to modern OSV, AHTS, Research, Drillship, Wind Farm Support vessels, rigs and more.

- Our customers are EPC providers, construction yards, FPSOs, drilling operators, ship owners, navies and oil companies.

- We are a world leading supplier of versatile offshore load-handling and rescue systems, providing offshore industries with precision and heavy duty tools that expand the operational envelope on all fronts.

- In-house technology and award-winning solutions. MacGregor Norway has won three Offshore Support Journal (OSJ) innovation awards.
FibreTrac Design Philosophy

- Fibre rope: load capacity not limited by depth
- Fibre rope has improved: better materials/coatings etc
- Splicing possible on board
- BENEFIT: flexible tool on smaller vessel = cost savings!
- No reason why fibre-rope cranes cannot compete in the market with combination of:
  - proper rope handling
  - accurate rope-health monitoring / prediction
  - ability to replace rope sections or extend as needed
FibreTrac Design Philosophy

- Combine known, tested, certified technologies:
  - MacGregor’s upgraded subsea crane
  - Parkburn’s innovative deep water capstan (DWC)
  - Lankhorst’s newest synthetic high capacity lift rope
  - VisionTek’s 3D scanning and measurement system
  - Applied Fiber’s rope termination socket

- Tie together and manage all with crane control system (CCS) and Lift-Line Management System (LLMS)

- Work with Class Society to develop plan for requirements and testing

  **KISS: Do not defeat benefits with complexity!**
FibreTrac Certification

- Hand-in-hand with DNV.GL
- ST-378 certification (lifting appliances) covers basic crane and primary equipment. For fibre-rope cranes: system must account for rope health and lifetime evaluation.
- ST-E407: defines criteria/process for such evaluations

ASSURANCE CASE FOR FIBRE-ROPE
FibreTrac Crane Overview: Rope

- DSM Dyneema® fibres with DM20 XBO coating
- Lankhorst Lanko®Deep rope: 12 x 3
- SWL: 150t
- Ø88mm
- L: 4000m (competes with 500t steel-wire cranes here)
FibreTrac Crane Overview: Rope

- Specially engineered termination socket by Applied Fiber
FibreTrac Crane Overview: Rope

- Rope + Termination Testing:
  - Loaded to 2432 kN and held for 30 minutes.
  - Cycled 100 times 97kN to 486 kN, 100 times 97kN to 973 kN, 3000 times 97kN to 1596 kN
  - Rope then pulled to failure at 542t: (3.61 X SWL)
FibreTrac Crane Overview: Crane Layout

- Familiar knuckle-boom design, some re-engineering
- High tension side (red): very few bends, no twisting / fleeting forces; lightweight, Sheave D:d = 30 → gentle on rope
- DWC: boundary between High / Low T
FibreTrac Crane Overview: Crane Layout

- Low-Tension side (blue):
  - tension-regulating,
  - spooling,
  - storage
FibreTrac Crane Overview: Crane functions / modes

- **Main spec:** 150t@15m (11m in offshore)/4000m, 30t@35m, 10t@36m
- **Slew:** Normal mode, unlimited slewing
- **Jibs:** Normal mode
- **Tugger winches:** Normal mode / CT mode
- **Whip winch:** Normal mode / personnel mode / CT ship-to-ship mode

- **Main winch (system):**
  
  NORMAL MODE / COMPENSATING MODE / SERVICE MODE
  
  - **DWC:** Normal mode / AHC or ART mode / Manual mode
  - **Spooling unit:** AP mode / AP mode / Manual mode
  - **Storage Winch:** Tension mode / Tension mode / Manual mode
FibreTrac Crane Overview: Parkburn DWC

- Twin drums, co-located and offset in angle and horizontal plane, act as tension-winches, gently and evenly removing load from the rope.

- Numerous contact surfaces for gradual, gentle de-tensioning – also aids in cooling.

- V-angle for auto-rope spacing (numerous types / sizes of rope including twin-ropes)

- Drum-halves offset for elliptical rope path
FibreTrac Crane Overview: CCS/LLMS

**autocool**
(on Hi-T sheaves and capstan)
FibreTrac Crane Overview: CCS/LLMS

- DSM algorithm
- VisionTek
- autocool
- LLMS
- IMS
- VisionTek

Advanced 3D rope inspection, measurement, flex database
FibreTrac Crane Overview: CCS/LLMS

CCS

LLMS
- DSM algorithm
- VisionTek
- autocool

IMS

HMI
- simplified
- (real-time)
- full historical data

MACGREGOR
FibreTrac Crane Overview: CCS/IMS

- IMS data optimised for operator (traffic-light simplicity for all rope segments’ health/life)
FibreTrac Crane Overview: CCS/IMS

- Full IMS data and VisionTek database info for service personnel
FibreTrac Crane Status

- Currently on test foundation in Kristiansand
- Crane tests commencing from the beginning of October
Questions
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<thead>
<tr>
<th>Perception</th>
<th>Reality</th>
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<tr>
<td>▪ Not robust, easy to damage or cut</td>
<td>▪ Used in many harsh environments including military, mining and aerospace</td>
</tr>
<tr>
<td>▪ Poor performance especially in AHC applications</td>
<td>▪ Testing proved <em>exceeds steel</em> in CBOS and tension-tension cycles</td>
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<tr>
<td>▪ Lack of track record</td>
<td>▪ In use since mid 2000, Skandi Santos commissioned 2010 (125t system still using same rope. No salt or grit issues.</td>
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<td>▪ Suffers from salt crystal or grit damage</td>
<td>▪ UV not an issue, especially with large ropes</td>
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<tr>
<td>▪ Needs to be treated with kid gloves</td>
<td>▪ AHC heat can be managed – same issue with wire.</td>
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<tr>
<td>▪ UV degradation</td>
<td></td>
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<tr>
<td>▪ Poor heat performance</td>
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FibreTrac Crane: Discussion - Rope

**Dyneema® Facts:**

**High Strength:** weight for weight, fibre-rope is 15 X stronger than steel wire

**Light Weight:** size for size, a fibre-rope 8 X lighter than steel wire rope.

**Water resistant:** hydrophobic and does not absorb water, meaning it remains light when working in wet conditions.

**It Floats:** Specific Gravity of 0.97

**Chemical resistance:** chemically inert, and performs well in dry, wet, salty and humid conditions, as well as other situations where chemicals are present.

**UV Resistant:** very good resistance to photo degradation, maintaining its performance when exposed to UV light

+ Much easier to handle, possible to splice, no kinking, crushing, splintering, no recoil on breaking.