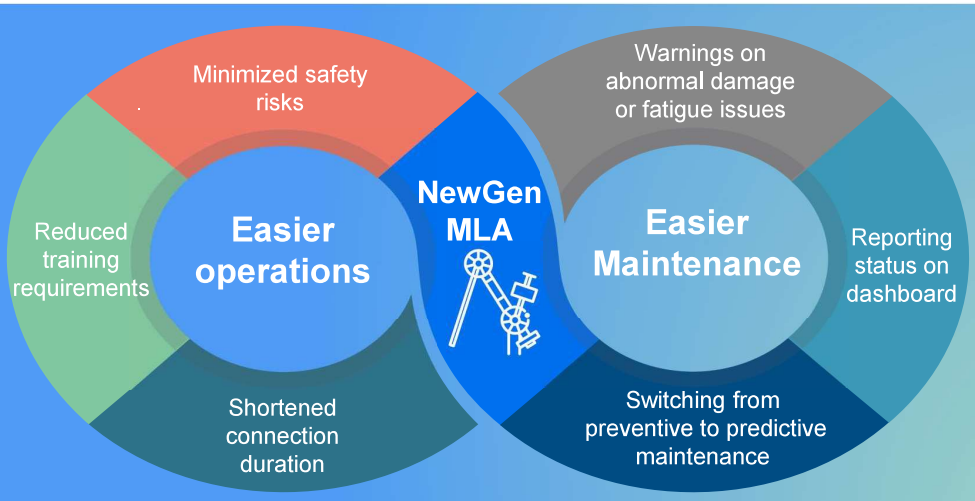
4 NewGen MLA

NewGen of Marine Loading Arms

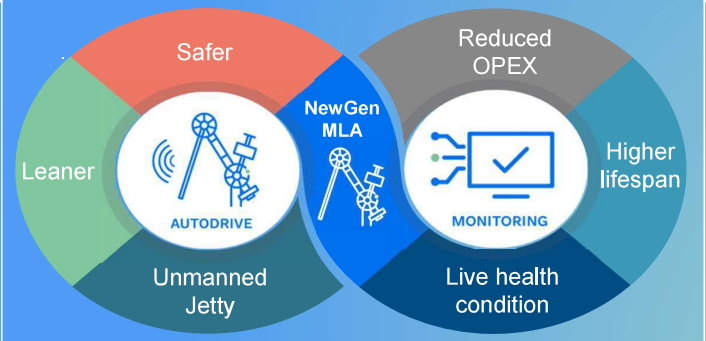


Our vision is to improve and ease drastically your Marine Loading Arm user experience, from both operation and maintenance perspectives

NewGen of Marine Loading Arms

AutoDrive Offering

- **Safer**
  - Avoid human errors & prevent hazards
  - Prevent from damaging the ship manifold flange and jetty equipment
- **Leaner**
  - Minimize training requirements
  - Reduce connection time
- **Future unmanned operations**
  - Operations from a remote location
  - Facilitate operations in extreme conditions



Monitoring Offering

Optimized maintenance plan

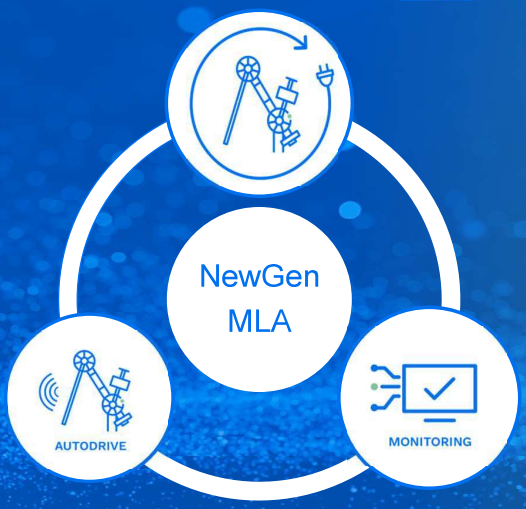
- Improve equipment lifespan
- Reduce OPEX
- Predict maintenance activities
- Live maintenance / health board through a Web base interface

Any type of onshore loading arm can be equipped with the AutoDrive and Monitoring capabilities (new-build or upgrade)

NewGen of Marine Loading Arms

electrification is an enabler

- Embedded monitoring via encoders & sensors
- Ready for AutoDrive System implementation
- EasyDrive System natively integrated



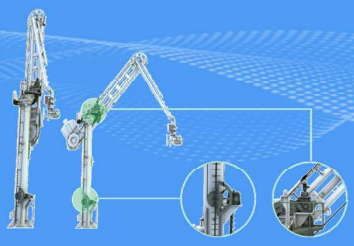
Additional benefits

- Simplified maintenance and reduced OPEX
- Mitigated environmental risks

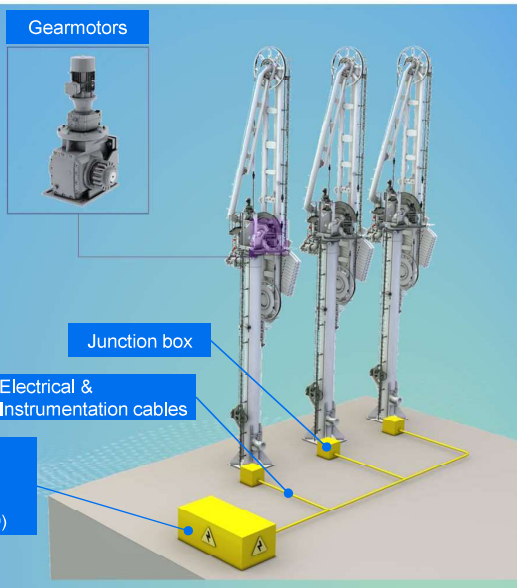
NewGen of Marine Loading Arms

What is eMLA?

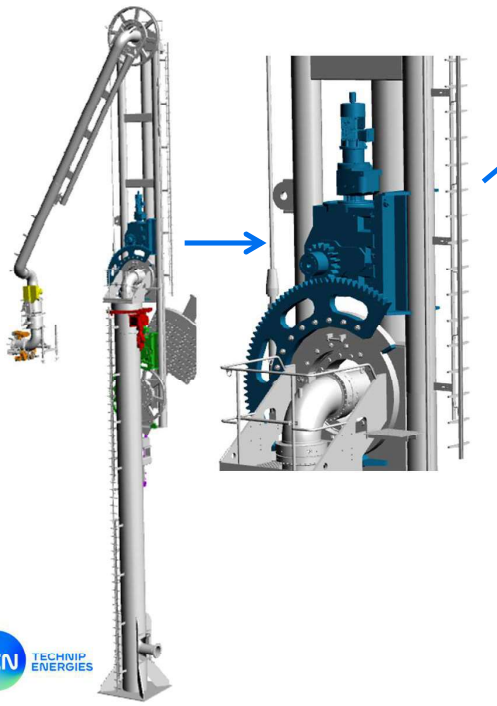
- **All-electric drive system**:
  - Induction gearmotors to replace hydraulic cylinders
  - Electrical cables to replace hydraulic piping
  - Electrical tension/intensity to replace oil pressure/flow rate
  - Variable Frequency Drives instead of HPU and solenoid valves
- **Field proven** electric components
- Applicable to **onshore** and **offshore** solutions

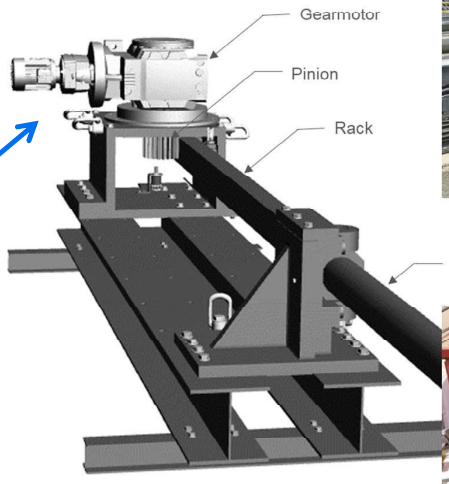


Control Cabinet:
- Local Control Panel
- PLC Cabinet
- Variable Frequency Drive (VFD)



eMLA – Qualification





Test bench

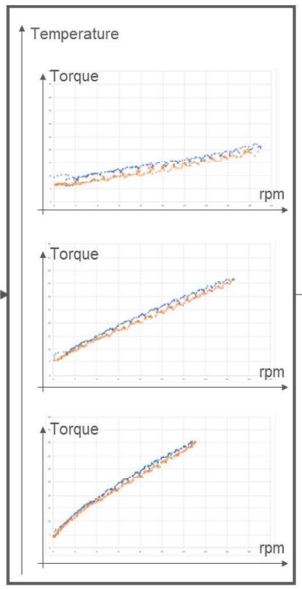
Test of brushless type gearmotor

Cylinder force controlled or motion controlled to simulate the MLA behaviour

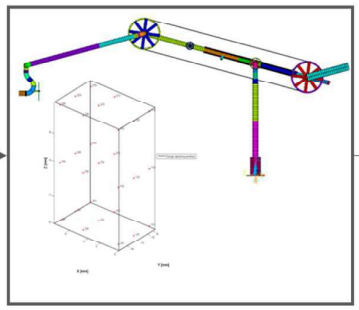
Test of induction type gearmotor

eMLA – Qualification

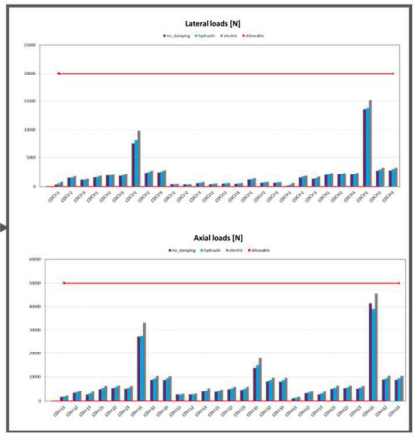
Freewheeling tests (up to -30 °C)



Gearmotor back-drive torque characteristic



MLA finite element model
Time domain analysis in connected mode
(MLA connected to ship manifold)



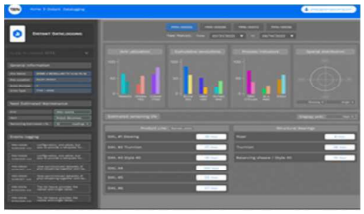
Loads at ship manifold
h-MLA vs e-MLA

NewGen MLA demonstrator

- A full scale 16" LNG loading arm is currently being manufactured to demonstrate the performance of the NewGen MLA
- An additional PLC will simulate virtually the 4 other loading arms of the jetty to reproduce all operating sequences

Data collection and post treatment

- Health monitoring of bearings, swivel joints, ball valves, couplers
- Assistance for operations
- Easy troubleshooting

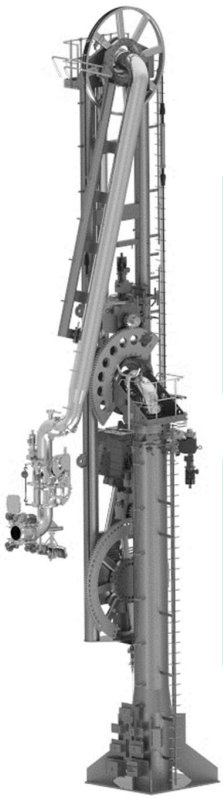


Automatic connection

- Vision sensor to measure the carrier flange pose
- Trajectory management during connection & disconnection
- Fully automatic connection

Automation of manual operations

- Automated orientation of the QC/DC flange
- Automated locking & unlocking of the loading arms



Electric Quick Connect/Disconnect Coupler and Emergency Release System

- Same field proven mechanical parts as for hydraulic ERS & QC/DC
- Fully qualified as per ISO 16904

Electric manoeuvring system

- Off-the-shelf actuators and VFD
- Fully qualified under multi-cycle testing in normal and extreme conditions
- Backup power for emergency disconnection managed by UPS

5 Take away

Take away

A new Generation

Improve drastically your loading arm user experience, from both operation and maintenance perspectives

Easier to operate

The loading arm connects automatically to the carrier flange:

- Minimize **safety** risks
- Reduce **training** requirements and staff
- **Shorten** connection duration
- Ready for **unmanned** operations

Easier to maintain

Key functions are instrumented and monitored:

- **Warn** about any abnormal damages or fatigue issues of key critical components
- **Report** overall status of the loading arm in a dashboard
- Switch from preventive to **predictive** maintenance

Using electric drive technology as an enabler

TECHNIP ENERGIES

Thank you