DTI TECHNOLOGY PROGRAMME

Renewable energy

CORLEX

Cost Reduction and Life Extension of Offshore Wind Farms

Project Leader : D M Shuter, Corus RD&T

The CORLEX Project

Title:	**Co**st **R**eduction and **L**ife **Ex**tension of Offshore Wind Farms
Partners:	Corus (coordinator) TWI Atkins Process CamCal npower renewables Sheffield Forgemasters
Total Cost:	£800k
Duration:	24 months (May 2005 – April 2007)
Funding:	40% of project costs will be paid by DTI

CORLEX Project – Programme

No.	Title	Responsible
1	Review Existing Tower and Foundation Designs	**Atkins**
2	Welding Technologies	**Corus**
3	Structural Health Monitoring	**Corus**
4	Risk Based Life Management (Start Q3)	**TWI**
5	Casting Technology and Design Optimisation (Start Q3)	**Sheffield Forgemasters**
6	Guidelines for Redesign (Start Q4)	**Atkins, Corus, TWI, Sheffield Forgemasters**
7	Project Management	**Corus**

WP1: Review Existing Tower and Foundation Designs - Atkins

1) To review existing tower and foundation designs and agree on which of these CORLEX will focus.

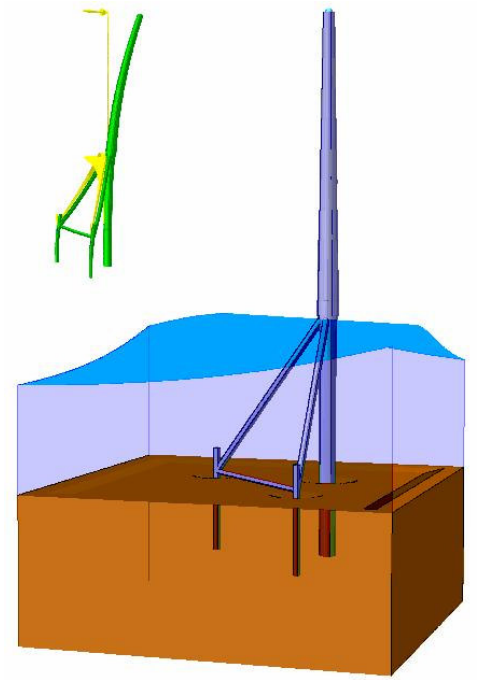
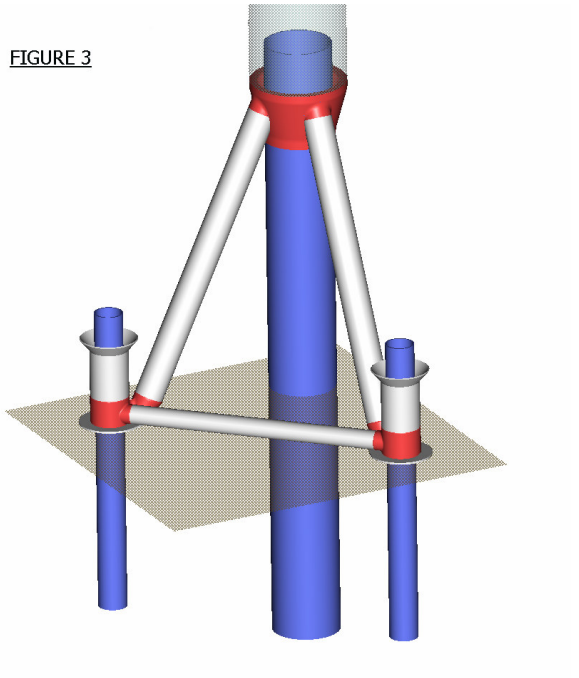


FIGURE 3



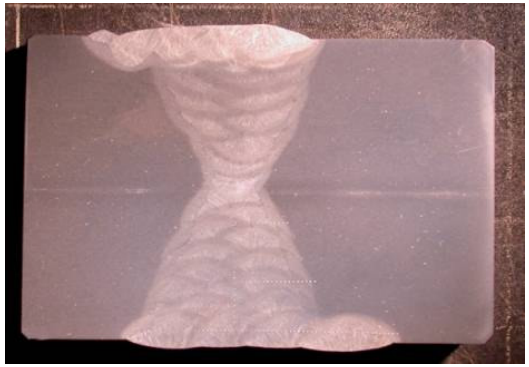
2) To provide a base-line of data (engineering and economic) against which developments in CORLEX can be compared.

WP1: Review Existing Tower and Foundation Designs

- Review existing tower and foundation designs.
- Produce Basis of Design for selected structure
- Consider wave and wind loading regimes. Determine stresses, strains, fatigue lives in agreed design(s)
- Perform weld / castings fatigue hotspot analyses
- Study the potential failure modes in chosen design(s)
- Determine the steel properties that are required
- Determine the limitations (e.g. design, construction) of the chosen designs
- Identify costs associated with chosen design(s) and provide a cost breakdown

WP2: Welding Technolgies - Corus

1) Assess Welding technologies:
   - Reduced Pressure Electron Beam Welding (RPEBW);
   - Non Vacuum Electron Beam Welding (NVEBW);
   - Multi-wire SAW ; and
   - SAW (benchmark)



2) Assessment of mechanical performance (fracture, fatigue) & potential economic performance (i.e. productivity, capital investment, running costs).

3) Identify the most promising welding technologies for different material thickness and whether the technologies may be economically viable.

WP2: Welding Technologies

4) Material

- An Offshore steel grade currently in use - S355 EMZ
- A "trial" offshore EN10225 S355G10 grade equivalent to BS7191 355EM.
- Possible future trends for offshore steel grades including S450EMZ and a TMCR high Nb, high strength steel grade will also be investigated.

WP3: SHM - Corus

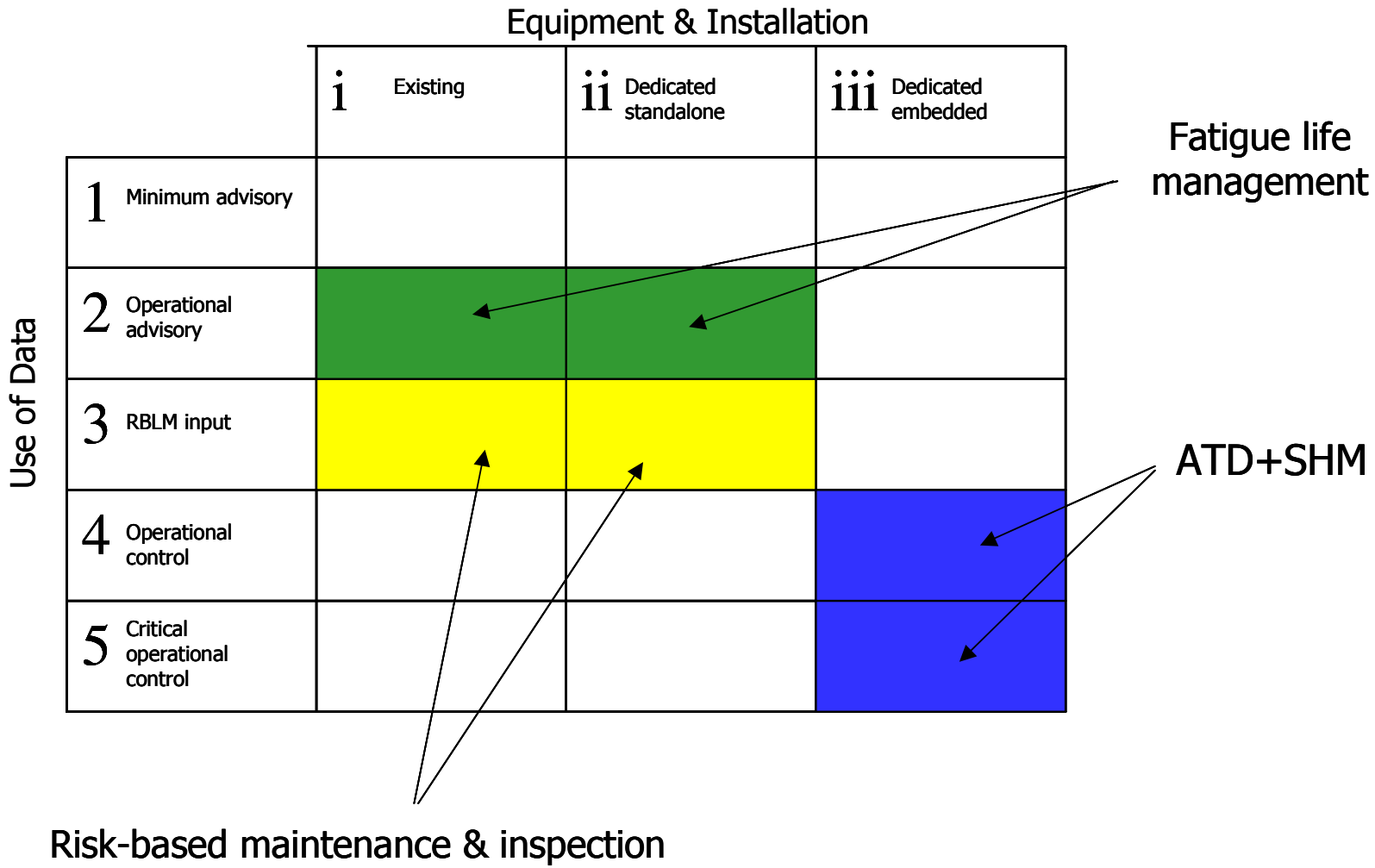
1) To assess the ability of structural health monitoring (SHM) to reduce costs of offshore wind farms

2) To produce a conceptual design and cost estimate for a structural health monitoring system

3) Workplan :

- Review of sensor technologies
- Review of condition monitoring in the wind energy industry
- Review of relevant codes and standards
- Case study of SHM systems in an offshore windfarm
- Conceptual "system" design

CORLEX SHM Specification Framework



WP4: RBLM - TWI

1) To develop a risk-based life-management (RBLM) methodology to reduce operating costs (maintenance & inspection) of offshore wind farms

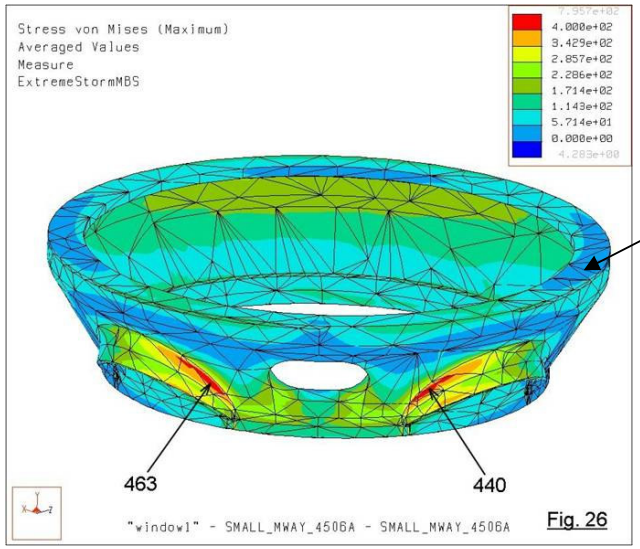
2) produce a prototype RBLM analytical software tool for use in the offshore wind sector

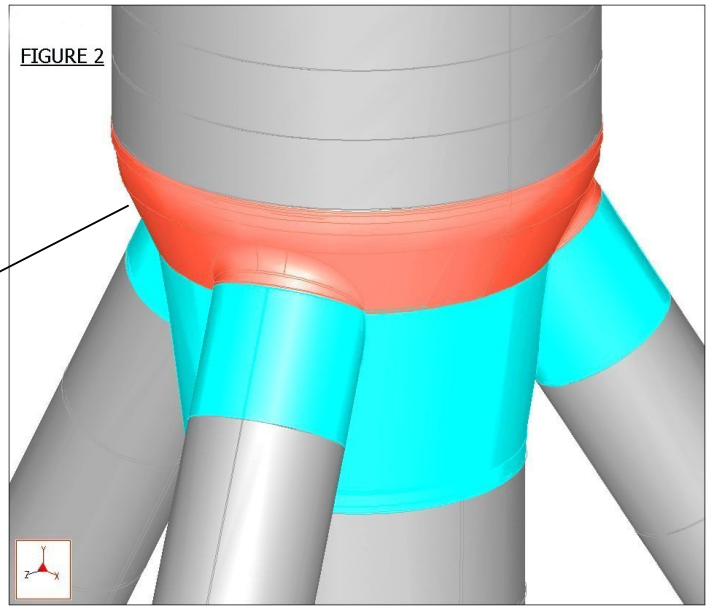
WP5: Casting Technology and Design Optimisation - SFEL

- To assess the capability of cast components (including novel design concepts) to replace welded joints in offshore wind structures
- To produce a production scale casting and establish a new, quick and cheaper manufacturing method
- To establish the feasibility of using permanent mould pieces and check achievable surface finish
- To establish costs and optional manufacturing methods
- To optimise casting designs with respect to weight and stress

WP5: Casting Technology and Design Optimisation - Workplan

- Shortlist of regions with potential to be optimised
- Optimise design of most critical regions
- Production of full-scale prototype





WP 6: Guidelines for Redesign

1) Benefits from:
   - New Welding Technologies
   - SHM
   - RBLM Tool
   - Use of Castings Technology

2) New Designs Concepts

3) Cost Benefit Analysis

4) Final Report

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