

ServiceReferenceSheet Innovation Development

1.0 Related Services

Pre-Construction and Installation Engineering, Project Management, Client Representation and Tendering, Procurement & Financial Support.

2.0 Introduction

Primo Marine has an extensive track record for delivering innovation developments. The ability to combine key theoretical knowledge with extensive practical experience has produced industry leading solutions related to dredging, installation, trenching and subsea assets. See below for brief summary of projects:

- First utilisation of Mass Flow Excavation for burial of HVDC cables (including approval from authorities’).
- New maintenance dredging for main waterways in the Netherlands.
- Upgrade of existing hydraulic trencher for burial of large diameter pipelines.
- Project Management for the fabrication of hydraulic excavation systems.
- Effectiveness of water-jetting in sand.
- Conceptual cable trencher for performance in adverse soils.

Primo Marine provides the following Innovation Development services:

3.0 Innovation Development – Engineered Solutions

Primo Marine offers a dedicated innovation development service, within comprehensive pre-construction engineering packages such as burial assessment, seabed mobility assessment and risk based burial design. Primo Marine applies expertise with in-depth knowledge to ensure performance and effectiveness of conceptual designs in order to provide clients with critical independent verification, prior to committing large capital sums on build programmes. Incorporated within the Engineered Solutions service is:

- Conceptual design studies including predicted performance in either soil, site and or subsea conditions.
- Independent theoretical performance verification.
- Appraisal of operational performance.
- Soil interpretation.
- Conceptual development of performance and effectiveness.

4.0 Innovation Development – Onshore & Offshore Project Management Solutions

Primo Marine offers a dedicated innovation development service, within a comprehensive Onshore & Offshore Project Management package. The provision of Project Management and Client Representatives, with extensive practical experience, in-depth knowledge and expertise to ensure design concepts are successfully introduced to the market. Primo Marine has an extensive track record for involvement in the introduction of new technologies and applies this knowledge first hand to resolve practical problems during all stages including offshore trials. Incorporated within the Onshore & Offshore Project Management Solutions service is:

- Management from design to build of new concepts.
- Management from design to build of upgrade concepts to existing equipment.
- Independent practical and theoretical performance verification.
- Practical appraisal of operational performance.
- Development and assessment of offshore trails.
- Practical problem solving expertise.

5.0 Innovation Development – Tendering

Primo Marine offers a dedicated innovation development service, to support the complete tendering and award phases. The application of practical expertise and experience to preparation, scope definition, evaluation, verification, selection and finally contract negotiation ensures mitigation of all technical risk profiles in offshore projects. Primo Marine also provides offshore performance management through the provision of its Client Representative offering. Incorporated within the Tendering service is:

- Definition of work packages.
- Technical preparation and evaluation.
- Technical verification and selection.
- Contract negotiations.
- Client Representation – operational performance management.

6.0 Innovation Development - Trenching

Primo Marine offers a dedicated innovation development service related to trenching. Either standalone or in combination with dedicated installation engineering packages. The provision of in-house trenching expertise including Client Representatives, with years of experience, which ensures pragmatic and effective solutions regardless of trencher type i.e. jetting, cutting and ploughing. This expertise combined with practical experience, gained from involvement in multiple trenching projects, ensures the overcoming of technical challenges such as the performance in a variety of soil conditions. Incorporated within the Trenching service is:

- Conceptual design studies including predicted performance in either soil, site and or subsea conditions.
- Independent practical and theoretical performance verification.
- Appraisal of operational performance.
- Soil interpretation.
- Conceptual development of performance and effectiveness.
- Management from design to build of new concepts.
- Management from design to build of upgrade concepts to existing equipment.
- Development and assessment of offshore trails.
- Practical problem solving expertise.
- Client Representation – operational performance management.

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7.0 Innovation Development – Dredging (Controlled Flow & Mass Flow Excavation)

Primo Marine offers a dedicated innovation development service related to dredging incorporating flow excavation. Either standalone or in combination with dedicated installation engineering packages. The provision of in-house dredging expertise including Client Representatives, with years of experience ensures pragmatic and effective solutions. This expertise combined with extensive and deep-rooted knowledge including land reclamation, ensures the overcoming of all technical challenges. Incorporated within the Dredging services is:

- Review of cable burial condition and permit requirements.
- Review of seabed bathymetric, e.g. sand waves.
- Review of soil conditions.
- Cable integrity calculations.
- Time schedule and budgeting.
- Establish scopes of work.
- Defining specifications.
- Client Representation – operational performance management.

8.0 Innovation Development – 3D Modelling

Primo Marine offers a dedicated innovation development service related to 3D modelling and designing for projects involving soil movement such as Pre-Sweep and/or Levelling. The utilisation of 3D visualisations assists all stages of a project, especially where it involves soil being moved in considerable quantities. Primo Marine's extensive 3D Modelling expertise provides a clearer understanding of the soil quantities, as the required investment is directly linked to the physical volumes, the overall risk is reduced during the execution of the project. Incorporated within the 3D Modelling service is:

- 3D modelling and design of soil works for dredging, reclamation, mining, offshore subsea works.
- 3D visualisation.
- Realistic 3D design of slopes, transition zones, intersections.
- Accurate volume calculations divided by area, layer, section, soil type etc.
- Determination of changes in volume for variation orders.
- Fly-by / fly-through animations.
- Translation of xyz data to a 3D Digital Terrain Model [DTM].
- Long- and cross sections.
- Method evaluation, selection and verification.

9.0 Case Study – Innovation Development

Primo Marine was contracted by Woodside, to review the technical feasibility relating to the design of a large rock trenching tool. The rock trenching tool was being designed to overcome stability issues and difficult soil conditions for the “Pluto” trunkline project. Primo Marine provided practical expertise and in-depth knowledge from its offshore dredging, trenching and environment background, in order to complete an in-depth evaluation of the components and marine operations. The combination of hard soils, stability issues, a large diameter pipeline and a rough marine environment resulted in providing engineered solutions to a challenging work-scope. Solutions including, due to the remoteness of North West Australia, the conducting of a stringent testing program in the North Sea with a scaled up model of the expected final design. The final outcome was Woodside decided to stabilise the “trunkline” via another solution and no further use of the trencher was considered necessary.