CORROSION PREVENTION AND INTEGRITY OF OFFSHORE STRUCTURAL ASSETS

MCPS LIMITED

MARINE AND OFFSHORE ANODE MANUFACTURER

Cathodic Protection Refurbishment

Initial planning and design determines whether your Cathodic Protection (CP) refurbishment will be successful or not. Offshore installations that have been in operation for many years with CP systems toward the end of their lives often utilise retrofit anodes to extend the life of CP system in turn the life of the offshore structural asset. Similarly if anodes are found too difficult to attach (in pre site installation) to the base of monopile foundation for offshore wind farms, then retrofit anodes can also be employed in situ. These anodes can be typically skid mounted or string type anodes that are uitilised in post structural installation by lowering the assemblies onto the seabed or hanging the string anodes around the foundation structure to ensure uniform current distribution.

Retrofit anodes reduce the need for commercial divers and can be electrically connected to the structures above the waterline using specially designed brackets or subsea using ROV's. CP designs can be reduced to 5 year systems and reduce or spread the cost for the operator. Retrofit anode brackets allow quick changing of anodes with planned maintenance programmes of the wind turbines.

Internal Cathodic Protection

Galvanic Anodes Cathodic Protection can be used to provide CP to the internals of Wind Farm foundations or ballast water tanks in semi submersibles. It must be noted that hydrogen is evolved from the CP process and the monopiles or tank internals must be well ventilated if cathodically protected with sacrificial anodes. MCPS does not recommend the use of ICCP systems in such enclosed spaces as the electrical cables are a serious potential to cause spark ignition of hydrogen evolved in the CP process. To reduce the amount of anode weight to install, and because of limited access, internal CP designs of monopiles can be reduced to 5 year systems similarly and commonly employed within ballast tanks of sea going vessels. Hanging String Anodes are distributed and lowered around the internals connected to Anode brackets that can allow quick changing of anodes with planned maintenance programmes of the wind turbines or Ballast Tanks.

The benefits of CP refurbishment are numerous; however the key points are:

- Detailed consultation and design ensure that the end product caters for our client's requirements, delivers its objective and performs as expected.
- In addition it will determine if the expectation is achievable, whether it can be delivered on time and most importantly if it can be delivered within budget.

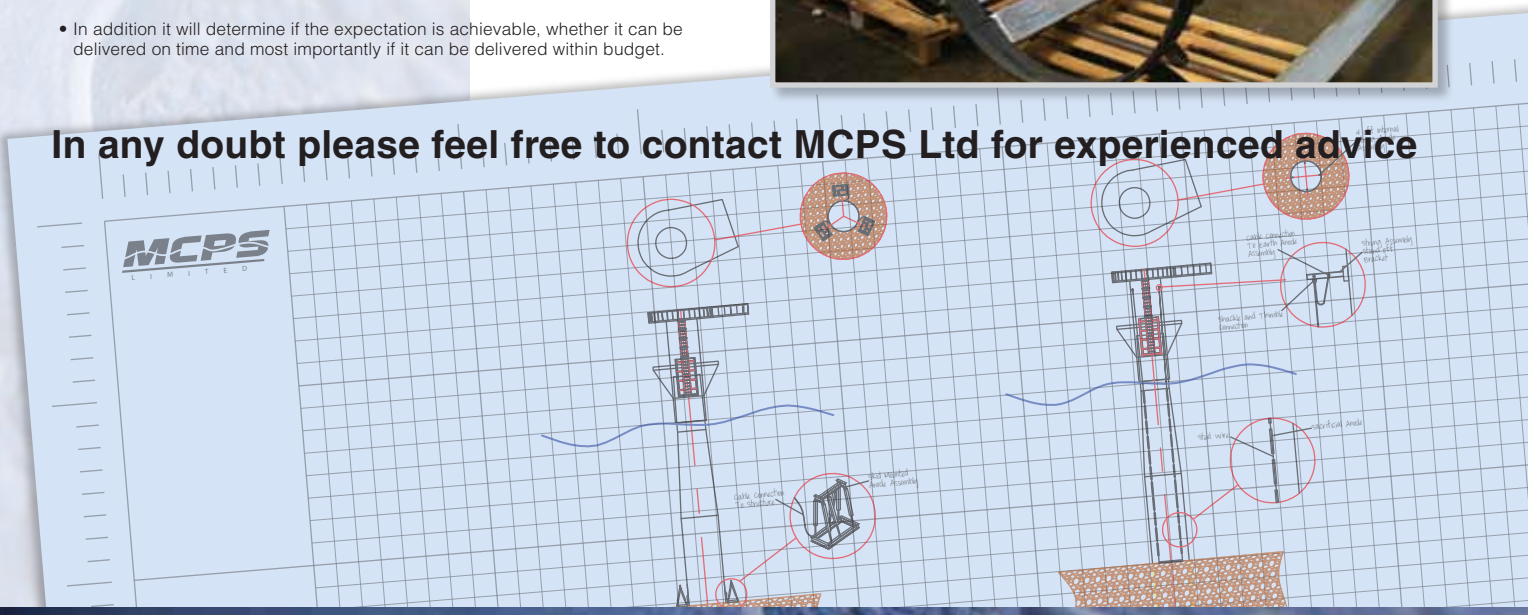
These important issues can only be achieved if detailed planning, design and consultation are carried out at the early stage of any project. Obviously there is the question of investment of time, resources and expenditure; however, this investment will pay dividends later on during the project. This early investment ensures timescales are met, performance criteria are met and the project is delivered to budget. There is no cost involved for an initial consultation where we will openly discuss the project, your requirements and the relevant regulations that may apply to your project.

We are happy to undertake any or all of the following roles on your behalf for Cathodic Protection refurbishment including detailed calculations and applicable design parameters (including but not limited to the following):

- Evaluation of exiting CP designs.
- Life extension and refurbishment of both Impressed Current (IC) and Galvanic Anode (GA) systems.
- Requirements for Anode Installation.
- Health and Safety Plans and Risk Assessments
- Feasibility Studies.
- Consultation and Advice.
- Cost Plans and Schedule of Works.
- Programme of Works.
- Cathode surface area calculations.
- Cathode current demand calculations (initial, maintenance and re-polarization).
- Anode mass calculations.
- Expected anode current calculations.
- Professionally drafted CP distribution drawings in AutoCAD and PDF which provide Schematic diagram of proposed CP refurbishment showing proposed locations for each retrofit anode and its method of connection.
- Requirements for Anode manufacturing
- CP modelling to ensure desirable CP levels at areas furthest from the anodes.
- Retrofit Anode Installation using Vessel supply and Dive Operations.

We look forward to discussing your project with you and giving you the professional, considered advice and guidance that your project requires from us as your CP provider utilising our highly skilled NACE (National Association of Corrosion Engineers) qualified CP Engineers in accordance with BS EN 15257 - Competence Levels and Certification of Cathodic Protection Personnel. MCPS designs are covered by the appropriate Professional Indemnity Insurance for Offshore and Marine Assets.

In any doubt please feel free to contact MCPS Ltd for experienced advice



MARINE CATHODIC PROTECTION SYSTEMS

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