

## Underwater Electric Potential

BEASY Corrosion and CP predicts the corrosion of ships, offshore structures, storage tanks, corrosion, pipelines etc and the effectiveness of Protection Systems. It also predicts the near and far field underwater electric potential (UEP) “signature” of ships and boats.



### Simulation

The BEASY model building system provides powerful and flexible tools to build models and visualise results. Geometry can be imported from CAD systems to further minimise the expertise necessary to use the software. The software can also be used with other graphical tools such as PATRAN.

BEASY uses the boundary element method to provide a simple but accurate approach to model building. Complete ships, boats or structures can be easily modelled using powerful graphical user interfaces. Only the surface of the vessel has to be defined with elements thus simplifying the model building process. BEASY provides the capability of

modelling using two dimensional, axisymmetry or fully three dimensional representation. Therefore models can consist of a complete ship or a detailed model of a critical part.

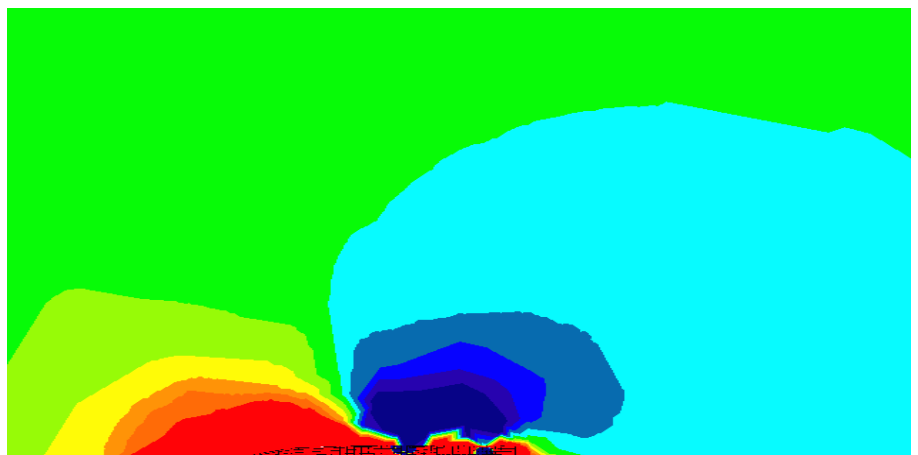
For example the design of an anode can be investigated in a detailed model of the anode and its holder and assembly. The best shape and configuration to obtain the optimum distribution on the structure surface can be investigated.

### Benefits and Capabilities

- Improved and more reliable design
- Simulation of galvanic corrosion
- Optimisation by simulation
- Design of cathodic protection system
- Electric field prediction
- Stray current corrosion
- Optimisation of anode location
- Life prediction
- Evaluation and presentation of inspection data
- Simulation of electrodeposition and other similar processes.
- Simulates changes in environmental conditions
- Electrostatic analysis
- Impressed and Sacrificial anodes system
- Simple modelling of large ocean regions
- Detailed representation of non linear polarisation
- Time dependent and steady state predictions
- Calculation of current densities and potentials on structure surfaces and in electrolyte
- Prediction of current demand
- Training simulator for CP design engineers.

### Corrosion Prevention

- Which method of protection will be most effective?
- Which method of Protection will be most economic?
- If coated, which paint impedance?
- If CP, what kind of CP system to use?
- If sacrificial system, how many anodes are needed?
- What distribution of anodes is the best?
- Life expectancy of the anodes?
- Etc . . . . .



*Predicted underwater potential field surrounding the ship. Note only half the ship has been studied due to symmetry*

## Material Properties and Polarisation

Material properties can be assigned to the model by simply defining the name of the material. BEASY supports a material database which describes the non linear electrochemical behaviour of the metals. Both static and time dependent polarisation data can be specified and the performance of the system predicted.

The material data can be added to by the user to include data obtained experimentally or from monitoring.



*Underwater electric potential 50m below the ship*

## Software Products, Technology Transfer and Consultancy

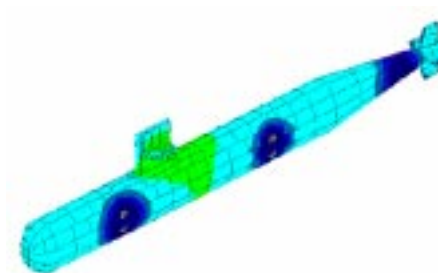
Computational Mechanics offers a flexible total solution which ranges from providing software tools, information and training and consultancy and problem solving. We also offer specialised software development and customisation which can be configured as part of a total technology transfer package to enable the customer to overcome technical challenges. Our links with the Wessex Institute of Technology provide an additional capability in advanced research and technical development. The Institute's international reputation for advanced numerical modelling and simulation enables the most complex problems to be tackled.

## Anode Control and Location

Any number of impressed and sacrificial (active or passive) anodes can be included in the model and their effectiveness predicted. The location and control strategy can be optimised by simply changing the model inputs. Parametric studies can also be performed to determine the key parameters to achieve the optimum



Independent CP systems can be defined in the models and stray current corrosion problems can be predicted.



*Predicted potential on the surface of the boat*

## Electrolyte

- The Electrolyte can be any Conducting Media eg
  - Sea Water
  - Concrete
  - Ground, mud or ice layers
- The model can contain any number of regions with different resistances eg
  - Sea Water and the Layer of Mud at the Sea Bed
  - Layered Ground
  - Earth and Concrete Structures

## Underwater Electrical Potential

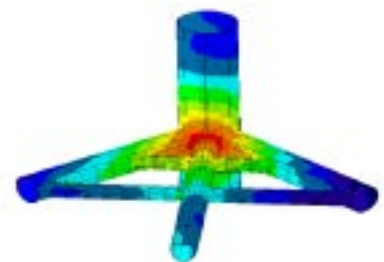
The Underwater Electrical Potential (UEP) both in the near and far field can be predicted. This information can be displayed numerically or visually to provide an indication of the condition of the structure, ship or boat.



*The performance of impressed and Sacrificial Cathodic Protection Systems can be assessed*

## Corrosion Prediction

- Which areas are affected?
- Where are the critical areas?
- How much will it corrode after a given time?
- How long will it take before it is critically corroded?
- What will be the effects of environmental conditions?
- Etc . . .



*Detailed model of an offshore structure showing level of protection*

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