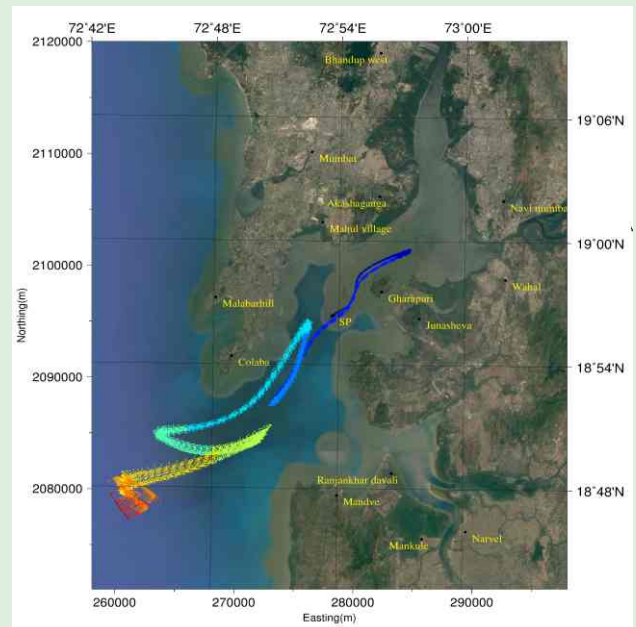
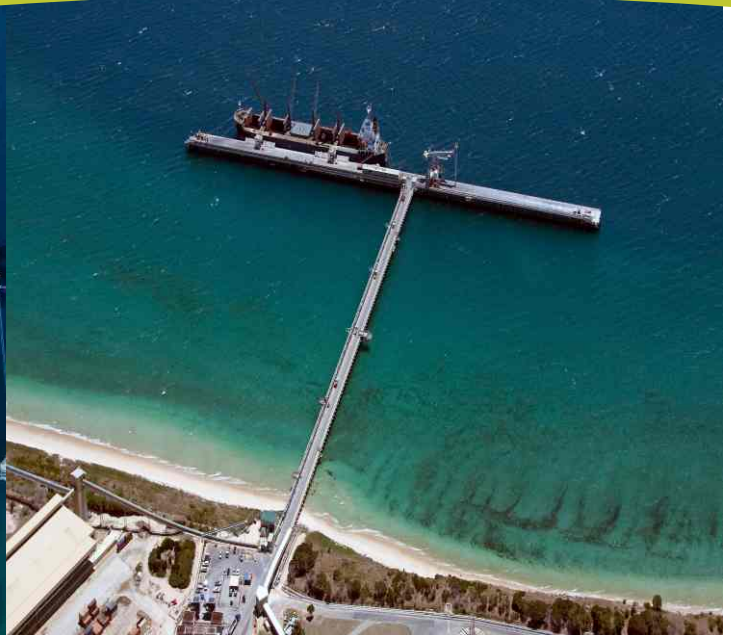


Hydrodyn - OILSOFT

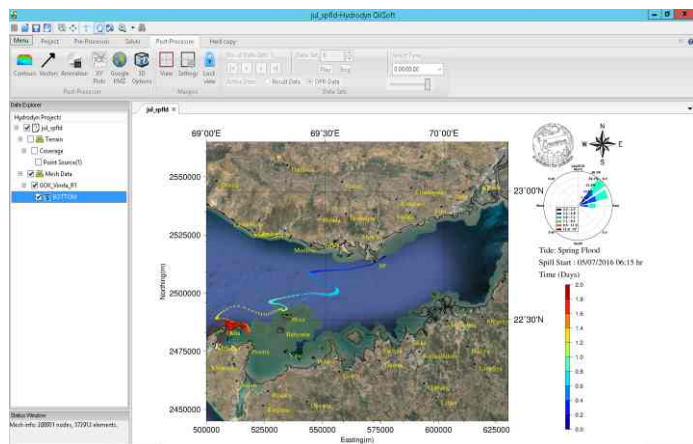


Environ Software Pvt. Ltd.

AD 2000+ Technology towards BC 2000 Nature

Ph. 080 2852 2191 / 92, E-Mail: environ@environsoftware.com

Oil is considered to be the major pollutant source in the ocean environment. It may arise either accidentally or operationally wherever oil is produced, transported, stored or used at sea. A potential oil spill is the most significant risk to manage in offshore oil and gas operations. In order to respond effectively, it is essential to know the trajectory of the spill, weathering characteristics and its likely target in the shoreline. The prediction of oil slick movement will help in taking appropriate decision for spill response and in directing the available resources effectively. The resources can be mobilized to the anticipated location in the sea or to a shore and plan the response operations can be planned ahead of the reach of the spill.



Hydrodyn-OILSOFT is an advanced software package, with a Graphical User Interface(GUI) consisting of pre-processor, multiple solvers and post processor that can simulate fate and movement of oil spills, in rivers, seas and coastal waters of estuarial systems in a complex geometry with high precision using higher order numerical schemes. OILSOFT provides rapid predictions of the movement of spilled oil in any meteorological and hydrological conditions. It includes user friendly graphical interface for entering both wind and hydrological data and specifying the spill source scenario.

Hydrodyn-OILSOFT includes many specialized features of graphics and menu driven pre/post processor for setting up the input, running the calculation, and selecting and obtaining graphical output from the analysis, animation facilities, trajectory plots etc. It allows fast, flexible creation and modification of computational models to reduce the possibility of errors in the input. It is available for Unix/Linux and Windows operating systems.

GRAPHICAL USER INTERFACE FEATURES

Hydrodyn-OILSOFT provides interactive Graphical User Interface (GUI) which guides the user for defining topographical features, specifying boundary locations, defining meteorological data options and preparing data base for various types of oils, defining spill location, volume and spill properties, selecting options for grid generation, specifying model parameters, selecting physical models, properties, boundary conditions and solvers, initialising the solver parameters, setting up solution controls, running the solvers, on-line animation facilities, hard copy utilities and extensive on-line help facilities.

Post Processor assists the user for display of solver output results graphically in various formats. GUI options are available for plotting of contour maps and color maps of model properties, simulation results such as water elevations, pollutant concentrations, flux variation at different locations, weathering properties of oils, plotting of flow velocity vectors, computational grid, contours of fate and weathering characteristics of oils, residual velocities, time history plots, spill trajectory plots, animation facilities, setting background colors of pre and post processor screens etc. GUI's Hard copy utilities helps the user to save the image pictures in standard formats and to export software results to ASCII text files supported by virtually any 3D visualization software. Online Help facility is also available in the GUI. This guides the user to help out in various stages in the preparation of input data and setting up the software.

GEOMETRY AND MESH SYSTEM

Hydrodyn-OILSOFT interface is built on Triangular grid generation module based on Advanced Front Technique which contains a logical menu interface that guides the user to generate the grid for complex domain shapes. The user can control the grid spacing in selected regions of the domain of study. Constant grid spacing, and spatially varying grid spacing options are also available while generating mesh.

SOLVER FEATURES

Hydrodyn-OILSOFT uses Finite Element Method to solve the Navier-Stokes and scalar advective-diffusive equations on Triangular grid system for prediction of hydrodynamic and pollutant variables. OILSOFT has both explicit/implicit solvers for solving the basic governing equations of flow and oil spills in a coupled way. Various modules including hydrodynamic, pollutant transport model, salinity and temperature models have been integrated into OILSOFT.

Hydrodyn-OILSOFT uses Lagrangian discrete parcel algorithm to solve the governing equations of fate and movement of oil spills taking into consideration, various processes including advection, mechanical spreading, horizontal turbulent diffusion, evaporation, dissolution and shoreline deposition. Emergency oil spill model for Risk Assessment and Oil Spill Contingency Planning and Search and Rescue Model have also been integrated into OILSOFT. The probability of spreading of spilled oil from any spill location is also calculated using the solver

- ◆ Uses the Finite Element approach, which allows modeling in 1, 2 or 3 dimensions.
- ◆ Solves equations for conservation of mass, momentum and energy for flow and immiscible pollutants
- ◆ Solves pollutant distribution in open surface flows and includes models for density variation.
- ◆ Uses 3D triangular grid so that the simulation can be done for any arbitrary shaped topography of flow domains.
- ◆ Has its own Grid Generator, which is based on Advanced Front Technique
- ◆ Uses sigma-coordinate system vertically, so that the irregular bottom topography of the estuarine bed can be studied more accurately.
- ◆ The user can select the boundary conditions at any location and select any type of boundary condition i.e. steady or transient.
- ◆ A graphical interface i.e. pre-processor is integrated to the model to define the required model inputs graphically.
- ◆ Various objects, i.e. bathymetric depth contours, islands, dykes, coastlines, etc. are represented by different colors to identify the objects easily.
- ◆ Interactive GIS data management system
- ◆ The solver has options to continue the pollutant computations alone after converging the flow field or both flow and pollutant simultaneously.
- ◆ The observation points can be selected at any location in the computational domain to monitor the output results and show the results graphically.
- ◆ It can display the oil slick trajectory at any time during the computation.
- ◆ It is capable of handling various type of oils in the prediction of fate and trajectory of oil spills in open waters.
- ◆ Integrated Spill Trajectory and Fates model, Stochastic model, Backtracking model, Subsurface Transport model for sub-sea releases and blowouts
- ◆ Comprehensive oil characteristic database
- ◆ Specify spill scenarios
- ◆ Input winds time series
- ◆ Enter and edit oil types in the oil library
- ◆ Display GIS resources affected by the oil trajectory
- ◆ The GIS utility is highly interactive and allows the user to enter, or import from external GIS sources, a variety of geographic data such as response resources, environmentally sensitive areas, and key coastal features.
- ◆ It has animation facility for output results of various file formats i.e. Bitmap, JPG, PNG.
- ◆ Dispersant effectiveness and over-flight update tools

SOFTWARE CAPABILITIES

- ◆ This software is flexible and can be used for any geographical locations in the world.
- ◆ It can be used to simulate slick trajectories in tidal and non-tidal flow domains.
- ◆ It uses a 3D triangular grid to map the physical domain features to be modeled exactly and with generalized flow boundary conditions.
- ◆ The model can be used for either continuous or instantaneous oil spills and the model takes into consideration various processes including advection, mechanical spreading, horizontal turbulent diffusion, evaporation, dissolution and shoreline deposition.
- ◆ It includes many specialized features of graphics and menu driven pre/postprocessor for setting up the input, running the calculation, and selecting and obtaining graphical output from the analysis.
- ◆ It allows fast, flexible creation and modification of computational models, while greatly reducing the possibility of errors in the input.
- ◆ It can be used either as a real-time basis to predict the movement of oil spill or as a scenario model to analyse the possible impact of accidental oil spill.

Some of the core features are mentioned below

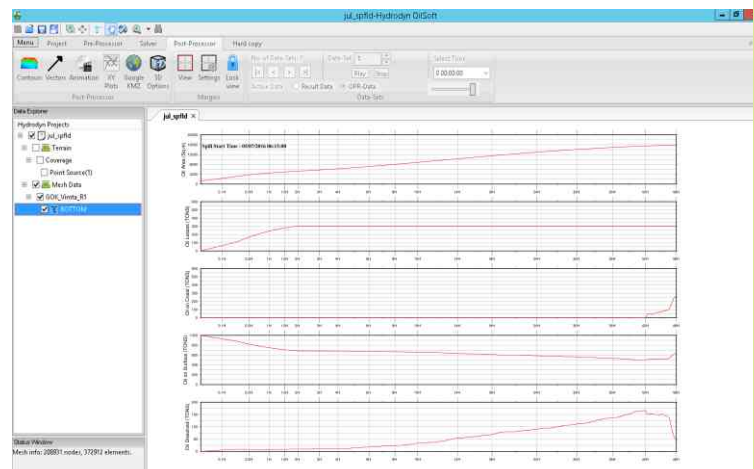
- ◆ Digitization of the raster images using .dxf files and .xyz files
- ◆ Drawing the coastal boundaries, triangular mesh generation with mesh refinement in selective region
- ◆ Applying the bathy using scatter points
- ◆ Saving the domain in binary format which reduces the size of memory compared to ascii format files
- ◆ Defining the boundary conditions and applying the tides and wind for boundary condition
- ◆ Defining the spill locations and oil properties
- ◆ Finite Element Method solving technics which involves fast computation and produces more accurate results
- ◆ Displays the contours, vectors while simulation goes on
- ◆ Saving the flow and trajectory result in binary format.
- ◆ Loading of huge result files takes less time compared to loading of ASCII files
- ◆ Plotting, extracting and saving of Time dependent results at selected observation points
- ◆ Capable of producing results in PNG format and saving
- ◆ Plotting of Oil spill trajectories and weathering properties
- ◆ Producing animation of velocity contours, vectors and trajectories

SOFTWARE APPLICATIONS

Hydrodyn-OILSOFT covers the following model applications

- ◆ Assessing the risks due to oil spills and impacts on marine life and ecosystem
- ◆ Either as a real-time basis to predict the movement of oil spill or as a scenario model to analyse the possible impact of accidental oil spill.
- ◆ It generates multiple stochastic simulations for selected spill locations using statistical or historical wind time series
- ◆ It can be run to determine most likely spill paths for spills on a monthly, seasonal, or annual basis.
- ◆ Output includes maps showing probabilities of oiling the water surface and shorelines in the vicinity of the spill site, and contours of oil travel time.
- ◆ The software output results can be used to determine the probability of oiling static resources which are stored in the GIS.
- ◆ The software can be used to perform reverse trajectory calculations for selected sites.

- ◆ Predicting the weathering and transport of spilled oil in surface and subsurface
- ◆ Calculations can be used to identify probable release locations of spills given current oil locations, or principal avenues of vulnerability for important resources.
- ◆ Outputs of the receptor mode are maps showing probabilities that the spill trajectory passed through a given area, and minimum time contours for spills to reach resources of concern.
- ◆ Predicting the probability areas of oil and their impact
- ◆ Risk assessments due to accidental or continuous oil spills and due to operational discharges/leakages
- ◆ Search and rescue operations
- ◆ Discharge of Immiscible Pollutants and its dispersion
- ◆ Tidal Circulation and Oil slick transport
- ◆ Oil spill Trajectory analysis
- ◆ Offshore oil platform, Water level and circulation study
- ◆ Analysis of various physical and chemical properties of oil spill in the offshore for EIA studies.
- ◆ Predict the probability of key areas being affected a given site (stochastic)
- ◆ Predict the backtracking the model to determine the likely spill location (receptor)
- ◆ Allow over-flight update predictions
- ◆ Predict boom-oil interaction
- ◆ Provide first order guidelines in the use of dispersant and help develop dispersion strategies around coastline
- ◆ Perform risk assessments for important resources e.g. beaches, fisheries, marine life, protected coastlines and industrial water intakes etc.
- ◆ Help review and update both national and regional emergency contingency plans
- ◆ Help develop coastal planning and management data bases using interactive GIS
- ◆ Help prepare and carry out both regional and national oil spill training exercises
- ◆ Provide management with a user friendly tool for decision support and effective visual communication in the event of an emergency spill incident
- ◆ Impact and risk assessment
- ◆ Oil spill response and contingency planning
- ◆ Resource management.
- ◆ Environmental impact assessments
- ◆ Protection and prevention strategies
- ◆ Environmental Audits
- ◆ Training courses
- ◆ Equipment review and recommendations
- ◆ Equipment commissioning, Exercise delivery
- ◆ Oil & chemical spill facility design
- ◆ Emergency response and spill management services
- ◆ To determine the vulnerability of a particular site to oil spills based on tanker traffic routes
- ◆ To determine possible sources of oil when oil has been observed at a particular site.
- ◆ Incorporating Boom-Oil interaction and dispersant Application



HYDRODYN - OILSOFT

OUR SCIENTIFIC SOFTWARE PRODUCTS

AIRSOFT : Simulation of pollutants spread in atmosphere.

FLOSOFT : Simulation of flow

STMSOFT : Simulation of Solute transport, Biodegradation, chemical Reaction processes in Ground Water flow system

NSPSOFT : Simulation of Noise Pollution

OILSOFT : Simulation of fate and trajectory of oil spills

POLSOFT : Simulation of Conservative and Non- Conservative Pollutant Transport

SURGSOFT : Simulation of surges due to cyclones

SEDSOFT : Simulation of Cohesive and non- Cohesive Sediment Transport

AHDSOFT : Analysis of Hydrographic Data For Tidal Management Practice

LIBSOFT : Library Management System

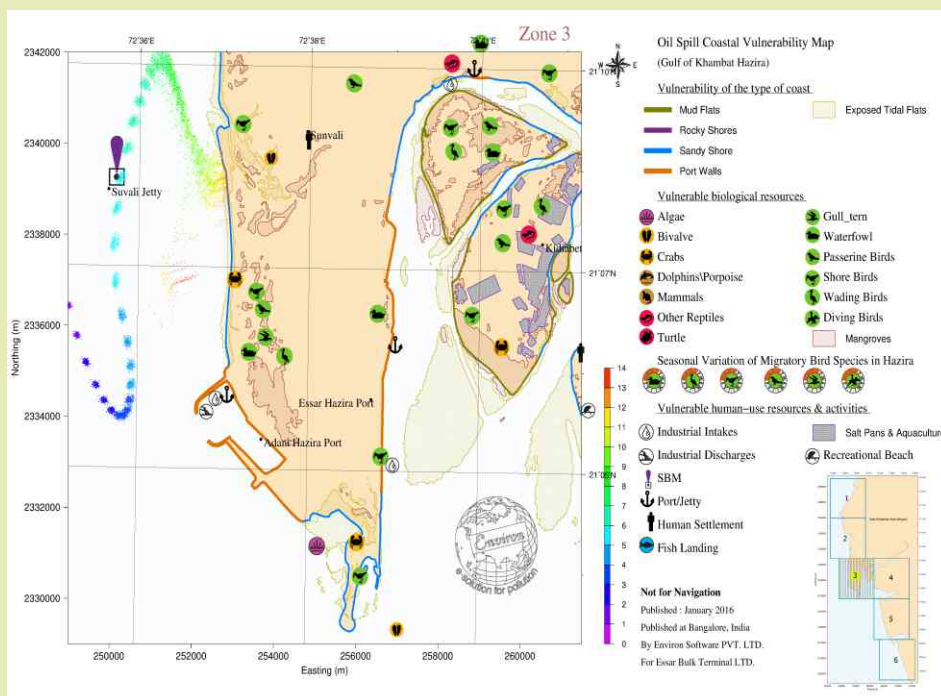
e-Institute : institutional Management System Software

e-Breeze : Office Automation Software

SOME OF OUR CLIENTS

- ❖ Adani Port Limited, Hazira
- ❖ Bharat Petroleum Corporation Limited, Mumbai.
- ❖ British Gas Mumbai
- ❖ Cairn India Limited, Noida
- ❖ Cairn Lanka Pvt Ltd (CLPL), Sri Lanka
- ❖ Chennai Petroleum Corporation Ltd., Chennai
- ❖ Coastal Energen Pvt Ltd (Energen), Chennai
- ❖ Department of Ocean Development (DOD), Chennai
- ❖ Dhabol Power Corporation, Dhabol
- ❖ DMCC Oil Terminals (Navalakh) limited, Gujarat
- ❖ Dubai port, Mina, Jabal Ali, United Arab Emirates
- ❖ Eco Chem Sales and Services-Surat, Gujarat
- ❖ Essar Oil Limited, Refinery Division, Jamnagar
- ❖ Gujarat Maritime Board, Gujarat
- ❖ Gujarat State Pollution Control Board, Gujarat.
- ❖ Gujarat Adani Ports, Katch, Gujarat
- ❖ Hindustan Petroleum Corporation Limited, Visakhapatnam

- ❖ IOCL, Port Blair, Andaman, Kolkata
- ❖ Indian Oil Corporation, Vadinar
- ❖ IPSHEM, Oil and Natural Gas Commission(ONGC), GOA
- ❖ Indian Oil Corporation Limited, Pipelines Division, NOIDA
- ❖ Jindal Shipyard Limited, Mumbai
- ❖ Lift and Shift Private Limited, Mumbai
- ❖ Reliance Industries Limited, Mumbai
- ❖ National Institute of Oceanography (NIO), GOA and its Regional Centers in Mumbai, Cochin and Visakhapatnam
- ❖ National Institute of Ocean Technology(NIOT), Chennai
- ❖ Surat Municipal Corporation, Surat
- ❖ Terra Firma Pvt. Ltd., Goa
- ❖ Trimex Heavy Minerals Pvt Ltd., Srikakulam, AP
- ❖ Vadinar Oil Terminal Limited, (VOTL), Jamnagar
- ❖ Vimta Labs, Hyderabad
- ❖ Walchandnagar Industries Limited, Dahej.
- ❖ Indian Institute of Technology (IIT), Delhi



Environ Software Pvt. Ltd.

60/4, Environ Towers, 4th Floor,
Hosur Main Road,
Konappana Agrahara,
Electronic City
Bangalore -560 100 India
Tel: +91 80 2852 2191/ 92
+91 94497 50282

Tele Fax: +91 80 2852 2949
email: environ@environcs.com
environ@environsoftware.com