

Introduction to the Petroleum Industry for the GIS Technician

Course Length: 3 days
ArcGIS Version: 10.x
App: ArcMap

Overview

This course introduces the GIS professional to the petroleum industry with an emphasis on portions of the industry that are managed with GIS. In this course, we discuss exploration, production and development of hydrocarbons, and take a tour of the Houston Energy Exhibit to get a better understanding of seismic data and well production, among other things.

Participants will get an understanding of how the key industry data elements are represented in a GIS. What attributes do we store for pipelines? What units are used to measure oil and gas production? What does a well pad look like? How do we represent the surface site, bottom hole location, and the full directional survey for wells? How deep are people drilling around the globe? What is a township/section/range line? What do I need to know about NAD27 vs. NAD83 and WGS84?

Audience

This course is primarily for GIS professionals who want to get a basic understanding of the petroleum industry.

Topics Covered

Day 1 – Petroleum Geology and Petroleum Exploration

- Introduction to the Petroleum Industry – A broad overview of the current, global oil and gas situation. (Global Demand for Oil; Active Fields Around the Globe; Active US Operations; Factors Affecting Global Operations; Upstream/Midstream/Downstream Activities; Understanding the Professional Titles in the Petroleum Industry; Mapping Global Oil and Gas Activity)
- Petroleum Geology – Basic introduction to the rock cycle, where petroleum comes from, and how it collects into pools underground. (Plate Tectonics; Faults, Folds and Salt Domes; Geologic Ages; Types of Rocks; Petroleum Accumulations; Traps; Reservoir Fluids; Porosity and Permeability; Mapping Geologic Structures and Petroleum Fields)
- Petroleum Exploration – The various methods used to detect and assess potential oil and gas pools beneath the surface. (Seeps; Seismic Data; Gravity, Magnetic and Electromagnetic Surveys; Well logs; Core Samples; Digital Sweet Spot Mapping; Play Assessments; Hyperlinked Well Logs; Mapping Seismic Lines; Understanding the Process of Sweet Spot Mapping)

Day 2 – Land, Drilling and Production

- Mineral Rights and Leasing – Understanding who owns the land and the oil beneath the land, and how business agreements are made for drilling. (Mineral Rights Ownership; Oil and Gas Leases; US Federal Lands; The Language of Leasing; Surface Ownership; Royalties; Provisions of a Lease; Support Agreement; Lease Sales; GOM Leases; Mapping Leases; Analyzing Lease Data; Sources for Lease Data)
- Land Mapping – Does your state use a Township system or something different? How do you read that legal description on a lease document? (PLSS; Coordinate Systems; Legal Descriptions; COGO; Labeling Leases; Dealing with Stacked Leases)
- Components of Drilling Important to a GIS Technician – Understand the flow of the drilling process, the resources needed, and how it's maintained. (Basic Drilling Process; Mud; Cuttings; Flow Lines; Drill Rigs; Mapping Rig Location; Platforms; Water Management; Well Pads; Environmental Constraints; Types of Wells; Drill Result Descriptions; Drilling Terms; Wireline Logging; Mud Logs; Well Attributes)
- Production Practices – Various methods for coaxing petroleum out of the ground, and understanding what the different pieces of that process mean in GIS. (Completion; Pumping; The Well Head; Hydraulic Fracturing; Injection Wells; Well Pad and Well Field Infrastructure; Measuring Production; Mapping Wells by Status)

Day 3 – Pipelines, HSE, and Museum Tour

- Pipelines – Different types of pipelines, rules and regulations, monitoring pipelines, and acquiring pipeline GIS data. (Transmission Pipelines; Gathering Systems; Maximum Allowable Operating Pressure; Pump Stations; Tank Farms; Pipeline Regulations; Pipeline Data Models; Linear Referencing for Pipelines; Pipeline Right of Way Management; Mapping Proposed Pipelines; Organizations Responsible for Pipeline Regulations at the State Level; Data Sources for Pipeline Data)
- Health, Safety and Environmental Considerations – Understand the ways in which each step in the petroleum life cycle can impact the surrounding environment. (Mapping Environmental Constraints Near Drilling Activity; Sources for HSE Data)
- Guided Tour of the Houston Museum of Natural Science Weiss Energy Hall. (Petroleum Accumulations; Global Fields; Offshore Seismic; Well Logs; Types of Oil; Hydraulic Fracturing)

Prerequisites and Recommendations

Students should have knowledge of Microsoft Windows® and be very comfortable with ArcGIS.