



Pre-Requisites:

- Our courses can be targeted to either the experienced engineer requiring refresher training or to staff new to the industry. We would encourage groups to be of similar experience to allow best differentiation of learning. Trainee Group Sizes (2-6).
- The only prerequisite is a willingness to embrace both the classroom and practical theory.
- The courses are delivered in English. However we can assist with arranging translation services if required.
- Inclusive accommodation is available on location in Somerton, UK for groups sizes up to 6. Lunch is also provided.
- We recommend trainees bring a laptop PC for classroom theory.
- Health and Safety - All course tasks are risk assessed and take place in a safe environment. All PPE items are provided, although we advise trainees to bring their own protective footwear to ensure maximum comfort.

ASL understands the diverse skill sets required for providing an effective borehole seismic service. We can tailor our training courses appropriately to meet the needs of the seismic field engineer, technical/electrical maintenance engineer, in addition to providing a more general industry overview and well-deployment experience to business development/administrative staff and engineering/geoscience undergraduates.

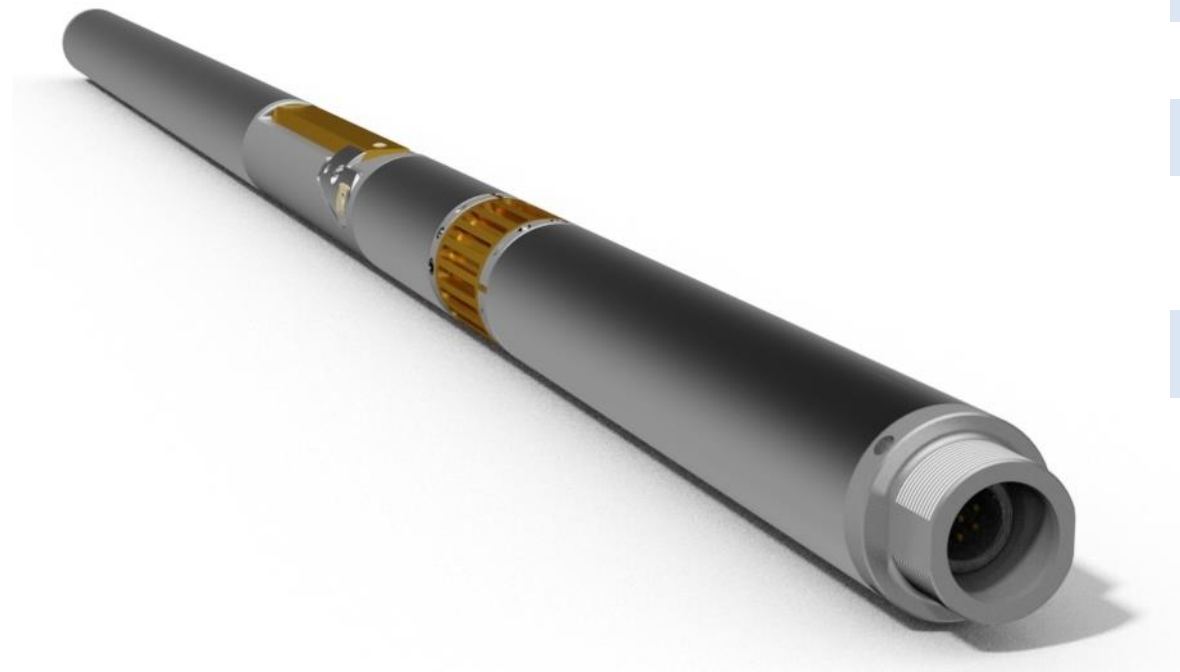
Module Title	Avalon Maintenance Course	Field Engineer Course	Avalon Borehole Seismic Course	Geosciences Short Course
M1 Introduction to Geochain and Geochain Slim Systems				
M 1.1	Foundation Seismic Theory	Core Module	Core Module	Core Module
M 1.2	System Overview	Core Module	Core Module	Core Module
M 1.3	Downhole Connections	Core Module	Core Module	Core Module
M2 Geochain and Geochain Slim Routine Maintenance				
M 2.1	ASR/GSR Routine Maintenance	Core Module	Core Module	N/A
M 2.2	ASR/GSR Wire Insertion	Core Module	Core Module	N/A
M 2.3	VRS/SVRS Routine Maintenance	Core Module	Core Module	N/A
M 2.4	TAS/STAS Routine Maintenance	Core Module	Core Module	N/A
M3 Geochain and Geochain Slim Major Maintenance				
M 3.1	Arm Drive Major Maintenance	Core Module	Core Module	N/A
M 3.2	ITC Reheading	Core Module	Core Module	N/A
M4 Ancillary Tool Maintenance				
M 4.1	TCU Maintenance and Operation	Core Module	Core Module	N/A
M 4.2	Gamma Tool Maintenance and Operation	Core Module	Core Module	N/A
M 4.3	Cross Over Maintenance	Core Module	Core Module	N/A
M5 Advanced Electronic Maintenance of Electronic Components				
M 5.1	Technical Maintenance	Core Module	N/A	N/A
M 5.2	Advanced Maintenance of digital components	Core Module	N/A	N/A
M6 ACQ Acquisition Software				
M 6.1	Introduction to ACQ Software	Core Module	Core Module	Core Module
M 6.2	Internal System Tests	Core Module	Core Module	Core Module
M 6.3	Acquiring Data	Core Module	Core Module	Core Module
M 6.4	Simulating ZVSP	Core Module	Core Module	Core Module
M 6.5	Advanced ACQ	Core Module	Core Module	Core Module
M7 Well Operations				
M 7.1	Configuration of Geochain/Geochain Slim	N/A	Core Module	N/A
M 7.2	Configuration of Sources	N/A	Core Module	N/A
M 7.3	Acquire real ZVSP	N/A	Core Module	N/A
M8 VSP Processing Fundamentals using VSProwess				
M 8.1	Introduction to VSProwess	N/A	Optional Module	Optional Module
M 8.2	Further Data Processing	N/A	Optional Module	Optional Module
M 8.3	VSProwess-A rigside data QC Tool	N/A	Optional Module	Optional Module
M 8.4	Logs, Data formats and data displays	N/A	Optional Module	Optional Module



Course Overview

This course is targeted at field maintenance crew who wish to be able to perform routine and major mechanical and wiring maintenance of ASL downhole products.

Trainee Group Size: 2-6



LEADERS IN BOREHOLE SEISMIC TECHNOLOGY

Modules

ATC 1

Avalon Maintenance Course

Time Required:

4 Days for coverage of 1 complete tool system plus ancillaries
+ 2 days per additional alternative tool system

3 Days for Analogue System Only

Modules:

- M. 1 Introduction to your downhole system (Geochain/Slim/EHP)
- M. 2 Downhole System Routine Maintenance
- M. 3 Downhole System Major Maintenance
- M. 4 Ancillary Tool Maintenance (Optional)
- M. 5 Advanced Maintenance of Electronic Components (Technical Prerequisite)
- M. 6 ACQ Acquisition Software for Test

Module Topics

MECHANICAL ELECTRONIC

Can only be attended by qualified technical electronics staff.

Prerequisite



LEADERS IN BOREHOLE SEISMIC TECHNOLOGY

Course Overview

This course is targeted at Seismic Engineer crew who wish to be able to perform downhole seismic acquisition, tool diagnostics and rig-side QC processing using Avalon equipment and software.

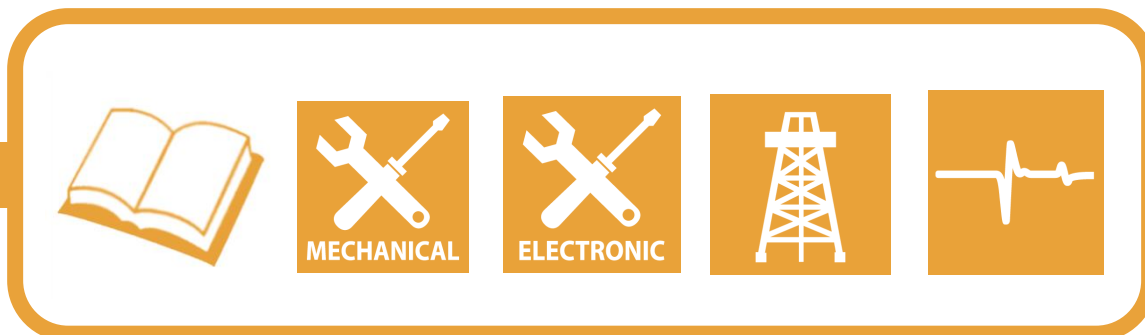
Trainee Group Size: 2-6



Modules

ATC 2	Avalon Field Engineer Course
Time Required:	5 Days for coverage of 1 complete tool system plus ancillaries + 2 days per additional alternative tool system 3 Days for Analogue System Only
Modules:	M. 1 Introduction to your downhole system (Geochain/Slim/EHP) and borehole seismic principles. M. 2 Downhole System Routine Maintenance M. 3 Downhole System Major Maintenance (Optional) M. 4 Ancillary Tool Maintenance (Optional) M. 6 ACQ Acquisition Software for Test and Data Acquisition M.7 Well Operations, Shooting a real VSP
Comments:	M. 8 VSP Processing Fundamentals using VSProwess

Module Topics



None.
Background in engineering/field acquisition beneficial.

Prerequisite



Course Overview

This course is targeted at trainees who may wish to have a general appraisal of our downhole tool systems or borehole seismic theory in general. This can be a great tool for your management, sales, or administrative staff as well as graduate technical staff.

Trainee Group Size: 2-6

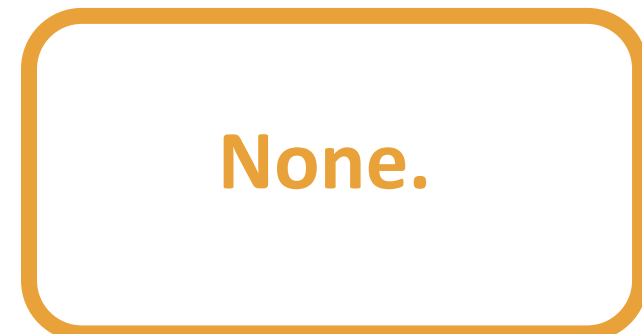
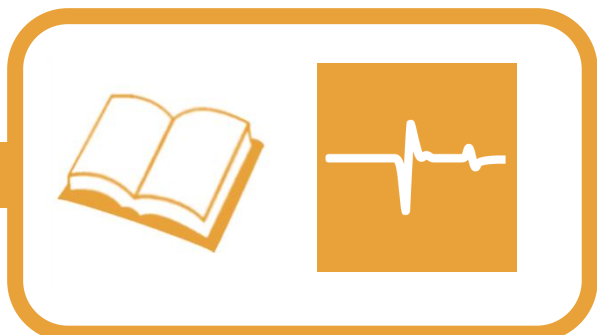


LEADERS IN BOREHOLE SEISMIC TECHNOLOGY

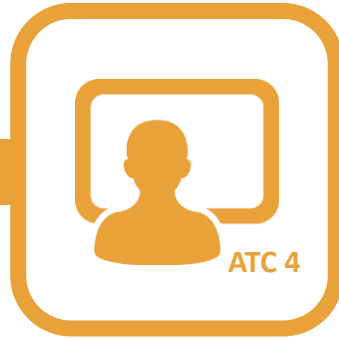
Course Modules

<i>ATC 3</i>	Avalon Borehole Seismic Short Course
Time Required:	2 Days
Modules:	M. 1 Introduction to Borehole Seismic Acquisition M. 6 ACQ Acquisition Software – Simple Acquisition M. 8 VSP Processing Fundamentals using VSProwess (Optional)
Comments:	

Module Topics



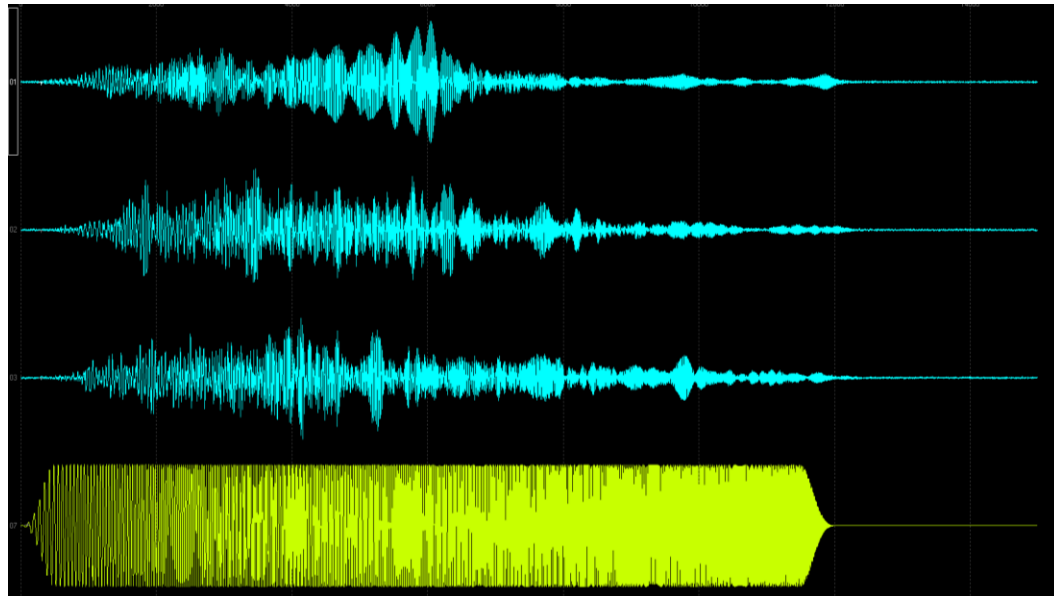
Prerequisite



Course Overview

This course is targeted at Geoscience trainees who may wish to have a general appraisal of our downhole tool systems, borehole seismic theory, and well deployment.

Trainee Group Size: 2-6



Course Modules

ATC 4	Geoscience Short Course
Time Required:	3 Days
Modules:	M. 1 Introduction to Borehole Seismic Acquisition M. 6 ACQ Acquisition Software – Advanced Acquisition M. 7 Well Operations, Shooting a real VSP M. 8 VSP Processing Fundamentals using VSProwess

Module Topics



Science Degree/2+ Years Field Experience.

Prerequisite



ATC 5 – Undergraduate Seismic Short Course

Course Overview

This course is targeted at undergraduate Geoscience students who wish to gain an appraisal of the role of seismic exploration within the Oil and Gas E&P industry.

The course has specific focus on introducing borehole seismic acquisition and processing fundamentals and will give the trainees an opportunity to shoot a real borehole seismic survey using advanced industry approved technology.



LEADERS IN BOREHOLE SEISMIC TECHNOLOGY

Modules

ATC 5 **Undergraduate Seismic Short Course**

Time Required: 1 Day ~09:00-17:00

Location: ASL HQ – Avalon House, Somerton Somerset – TA11 6SB

Modules:

- ATC 5.1 Foundation Seismic Exploration Principles with specific reference to borehole seismic application in subsurface exploration and monitoring.
- ATC 5.2 Simulation of a simple VSP using industry standard ACQ acquisition software.
- Lunch* *Provided by ASL*
- ATC 5.3 Practical – Field deployment of multilevel seismic tool string in to test well. Shooting and recording Zero Offset VSP using rig source sleeve gun.
- ATC 5.4 Basic overview of the ZVSP processing steps. Students process a real dataset down to common depth point (CDP) transform corridor stack and inversion – using VSProwess Software.

Trainee Group Size: 2-6

Module Topics



Seismic Theory



Acquisition



Processing

Trainees to have completed 2 years of a Geoscience degree course. Students asked to each bring laptop. PPE provided.

Prerequisite



Module Overview

This module is aimed at trainees who wish to gain a basic understanding of seismic theory and gain an understanding of the Geochain and/or Geochain Slim tool systems.

Difficulty: Foundation

No Prior Experience of using ASL Products Required

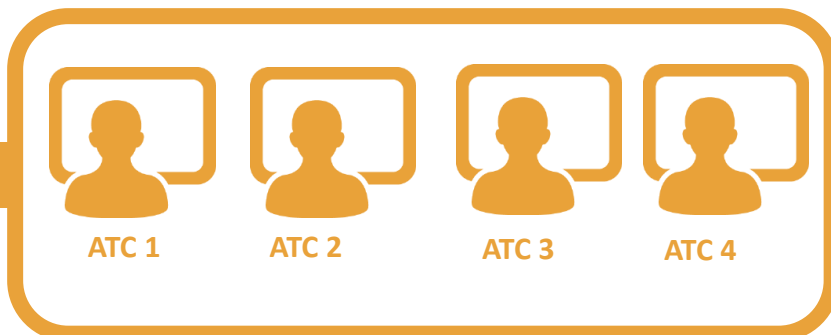
M1.1 Foundation to Seismic Theory

Learning Objective: Trainees will have an introductory understanding of seismic source exploration . Key concepts and the application of VSP and microseismic monitoring.

Topics:

- Basic Petroleum Geology – Defining an Oil and Gas Trap
- Wave Propagation and Reflection at an Interface
- Wavelet Theory Fundamentals and Seismic Resolution
- Surface Seismic Concepts
- What are VSPs and their Applications?
- Hydraulic Fracture – Induced Seismicity and Monitoring.

Relevant ATC Courses



LEADERS IN BOREHOLE SEISMIC TECHNOLOGY

M1.2 System Overview

Learning Objective: Trainees will gain an understanding of the Geochain and/or the Geochain Slim tool system functionality, along with surface tools required for operations.

Topics:

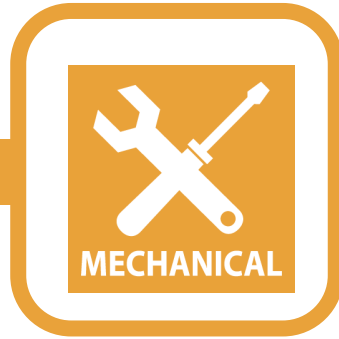
- Acquisition System Overview
 - Geochain System Concepts (Analogue or Digital)
 - Description of the Distribution Telemetry System
 - ASR Locking Arm Control
- System Power Distribution
 - Detailed Examination of the Geochain Power System
 - Voltage Regulation and the Functionality of the VRS
 - Combination of Telemetry Signals and Power in the Wireline
- Module Description and Function
 - Module by Module Description of Capability and Functions
 - Geochain Fail Safe System
 - Geochain Safe Recovery System

M1.3 Downhole Connections

Learning Objective: Trainees will have a deeper understanding of Geochain and/or Geochain Slim systems, downhole connections and will have an understanding of the importance of good tool diagnostics and maintenance.

Topics:

- Geochain System Checks
 - Checking and Installation of Inter-Tool Cable
 - Power System Routing
 - Digital Signal Paths
- Using Wireline Adaptors
 - Selection of Correction Adaptor
 - Checking and Installation of Adaptor
- TCU-Tension Compression Unit Connection
 - Capabilities and Functions of TCU
 - Checking and Installation of TCU
- Importance of Maintenance



Module Overview

This module is aimed at engineers and geoscientists who wish to carry out a Geochain and/or Geochain Slim routine maintenance.

Difficulty: Foundation

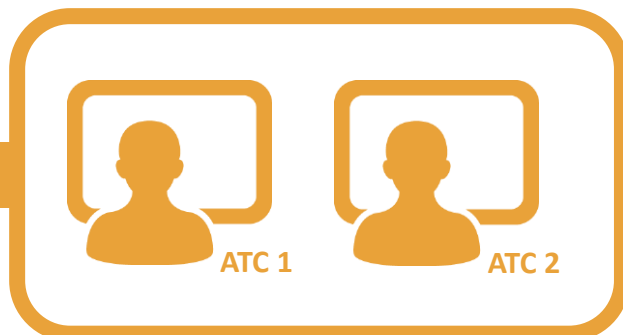
No Prior Experience of using ASL Products Required

M2.1 Standard ASR/GSR post Job Maintenance

Learning Objective: The trainee will gain the ability to carry out a standard maintenance on the ASR/GSR downhole satellites.

Topics:

- Arm Assembly
 - Removal of the locking arm and side arm
 - Disassembly of the spline shaft drive
 - Removal of O-ring seals and inspection of parts
 - Fitting of new O-rings seals and re-assembly
 - Re-assembly of locking arms
- Sensor Pack Assembly (ASR only)
 - Removal of geophone cartridge and lower barrel
 - Disassembly of lower barrel
 - Cleaning and inspection
 - Re-assembly of lower barrel with new O-ring seals
 - Fitting of lower barrel to tool
 - Inspection and test of geophone cartridge
 - Fitting of geophone cartridge



M2.2 Wire Insertion

Learning Objective: The trainee will be able to insert the tool body wiring and carry out basic electrical operational tests on the receiver tool.

Topics:

- Continuity and Insulation Test
- Motor Resistance Test

M2.3 VRS/SVRS Routine Maintenance

Learning Objective: The trainee will be able to carry out a routine maintenance of the VRS/SVRS section of the tool.

Topics:

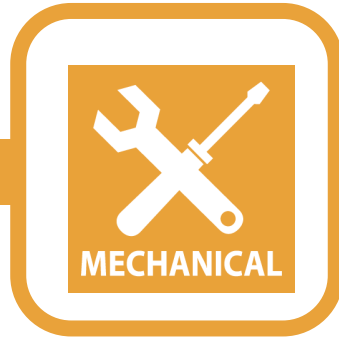
- Nose Cone
 - Removal of nose cone
 - Nose cone disassembly
 - Inspection and cleaning
 - Nose cone re-assembly
- VRS/SVRS Tool Body
 - Removal and maintenance of VRS plus (VRS only)
 - Removal of VRS barrel
 - Inspection and cleaning
 - Reassembly of barrel

M2.4 TAS/STAS Routine Maintenance

Learning Objective: The trainee will be able to carry out a routine maintenance of the TAS/STAS.

Topics:

- Removal of TAS Assembly
- Cleaning of threat rings and heat sink
- Re-greasing and re-assembly



Module Overview

This module is aimed at engineers who wish to perform a major maintenance of the Geochain and/or Geochain Slim downhole components.

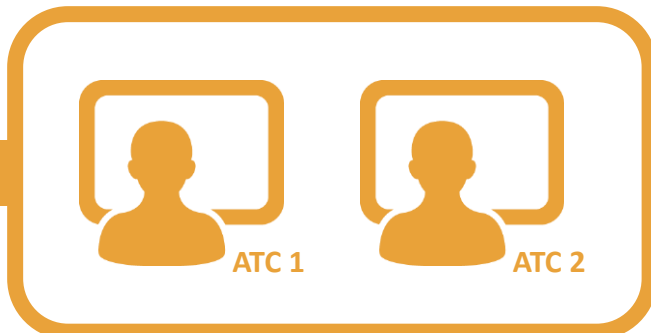
Difficulty: Intermediate

M3.1 Arm Drive Maintenance

Learning Objective: The trainees will gain the ability to carry out a full maintenance on the ASR/GTS arm drive assembly.

Topics:

- Arm Disassembly
 - Removal of locking arm assembly
 - Removal of lower barrel
 - Disassembly of Lemo mount
 - Extraction of arm drive assembly
 - Extraction of main bearing
 - Removal of clutch
 - Removal of motor
 - Disassembly of nut mount
 - Disassembly of main bearing
 - Removal of link arm
- Arm Drive System Inspection and Test
 - Inspection of springs
 - Main bearing check and lubricate
 - Drive screw check and lubricate
- Clutch Inspection
 - Clutch torque checking and adjustment
- Motor Check
 - Removal of motor and cap
 - Removal of motor sleeve
 - Inspection and cleaning of brushes
 - Re-assembly of motor
- Arm Drive Re-Assembly
 - Fit motor to motor mount
 - Re-fit nut to nut mount
 - Reassembly main bearing
 - Main bearing adjustment
 - Refit clutch mount
 - Insert main bearing assembly to motor mount
 - Refit main drive assembly to tool body
 - Secure motor mount
 - Re-install Lemo connector mount
 - Re-assembly locking arm assembly
- Post Maintenance Test Procedure
 - Tool wiring continuity check
 - Tool wiring insulation check
 - Moto resistance and insulation check
 - Refit lower barrel geophone cartridge
 - Re-fit electronic cartridge
 - Tool function test



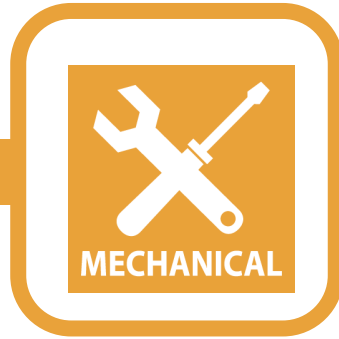
M3.2 Inter-Tool Cable Re-Heading

Learning Objective: The trainee will be able to carry out a full maintenance and re-heading of the ITC.

Topics:

- ITC Inspection and Testing
 - Continuity and insulation testing
- ITC Disassembly
 - Disassembly of cable heads
 - Separation of cable from taper bush
 - Inspection of taper bush
- ITC Re-assembly
 - Fitting of taper spring
 - Fitting of taper bush
 - Removal of outer armour and fitting outer cone
 - Removal of inner armour and fitting of cone
 - Cutting away excess armour wire
 - Cutting conductor to length
 - Fitting of boots and contact to conductor
 - Measuring cable length
 - Fitting of second tapered spring
 - Preparation of second cable end
 - Re-assembly of cable heads
- Post Maintenance Test Procedure
 - Checking continuity and resistance of conductor
 - Safety proof load testing





Module Overview

This module is aimed at engineers who wish to carry out maintenance on Avalon downhole ancillary tools.

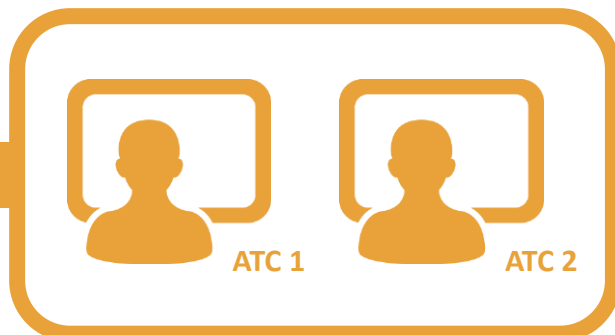
Difficulty: Foundation

M4.1 Gamma Ray Tool Maintenance

Learning Objective: Trainees will gain an understanding of the setup required for GRT tools and will be able to carry out a routine maintenance of the tool.

Topics:

- GRT gamma Tool Set-Up
 - Introduction to the GRT-X gamma tool
 - Installation of the GRT-X gamma tool
 - Connection interface to the DCP or WIB
- Gamma Software
 - Configure gamma software (Detailed in Module 6)
 - Acquiring gamma Data]
- Maintenance of the GRT Gamma Tool
 - Routine post survey maintenance
 - Disassembly of the GRT and removal of the gamma sonde
 - Re-assembly of the GRT



M4.2 TCU Maintenance

Learning Objective: Trainees will be able to carry out a full maintenance and checks of the TCU.

Topics:

- TCU Basic Checks
 - Checking continuity and leakage
 - Functional test
- Routine Post Survey Maintenance
 - Disassembly of coupling
 - Inspection and cleaning
 - Reassembly of coupling
 - Basic Checks
- Major Maintenance
 - Removal of lower connector mount
 - Inspection and cleaning of connector mount
 - Removal of lower barrel
 - Removal of centre barrel
 - Removal of upper connector mount
 - Removal of load cell
 - Removal of main shaft
 - Reassembly of load cell
 - Reassembly of upper connector
 - Reassembly of middle and lower barrel
 - Reassembly of lower connector mount
 - Continuity and insulation testing
 - Functional testing

M4.3 Cross-Over Tool Maintenance

Learning Objective: Training will be able to carry out maintenance on any of the following cross-over tools.

- | | |
|------------|---------|
| • HAL-RWCH | • BAS-1 |
| • HAL-DITS | • HAL-1 |
| • HETS | • HAL-7 |
| • LEHQ | |



Module Overview

This module is aimed at electronic engineers who wish to carry out a full maintenance on the electrical components of the Geochain and Geochain Slim tools.

Difficulty: **Advanced**

M5.1 Technical Maintenance

Learning Objective: Trainees will be able to carry out technical maintenance of the TAS/Digitiser.

Topics:

- Remove and Reflask Digitiser Electronics

M5.2 Advanced Electrical Maintenance

Learning Objective: Trainees will be able to carry out a full maintenance on the TAS/Digitiser.

Topics:

- Replacement of TAS/Digitiser Thermo Electric Cooler (TEC)





Module Overview

This module is aimed at Geoscientists and Engineers who wish to gain an understanding of ACQ acquisition software. They will be able to configure a tool system and perform diagnostics checks. The trainees may wish to go beyond this and learn to use ACQ to set up a VSP survey, configuring receivers and well site geometry. Trainees will be able to simulate a ZVSP acquisition exercise using ACQ.

Difficulty: Intermediate - Advanced

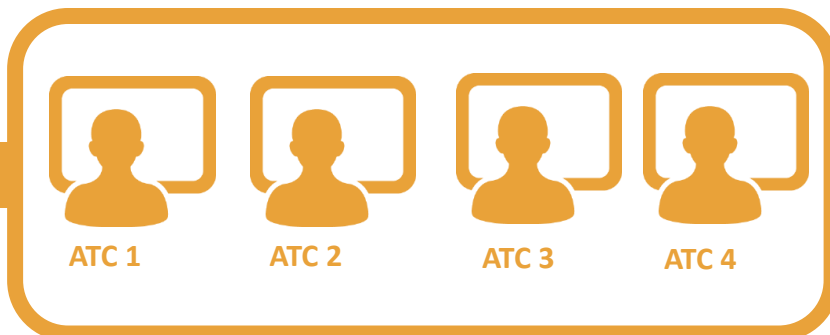
M6.1 Introduction to ACQ

Learning Objective: Trainees will be introduced to the software and will be able to use ACQ to configure a seismic survey job.

Topics:

- Software Installation
 - Install ACQ
 - Default folder used by ACQ
- Job Manager
 - Creating a new job in ACQ
 - Selecting recorder and downhole tool type
 - Specifying a non-default Rcd folder
 - Entering general survey information
- Configuration of source, surface channel and downhole tools
 - Configuration parameters for airgun sources
 - Configuration parameters for explosion sources
 - Setting up GSP control
 - Setting auto pick parameters
 - Setting up automatic source location acquisition from a navigation system
 - Configuring surface channels
 - Configuring downhole tools

ATC Course



LEADERS IN BOREHOLE SEISMIC TECHNOLOGY

M6.2 Internal System Test

Learning Objective: Trainees will be able to perform an instrument test and diagnostics in the ACQ software.

Topics:

- Instrument Test and System Diagnostics
- Spectral Analysis
- Using the Journal

M6.3 Acquiring Data

Learning Objective: Trainees will know how to acquire data within the ACQ software, and will be able to do a basic interpretation of the data.

Topics:

- Monitor mode and Tool Control
- Recording, Stacking, and Displaying Data
- Plot Mode
- Profile Mode

M6.4 Simulate ZVSP

Learning Objective: Trainees will be able to simulate a ZVSP, and interpret the VSP plot components.

Topics:

- Configuring the Survey Simulator
 - Types of survey which can be simulated
 - Choosing the downhole tool type
 - Configuring source
 - Configuring downhole tools
- Recording Simulation Data
 - How data is simulated
 - Recording data
 - Simulating telemetry errors
 - Features of VSP dataset

M6.5 Advanced ACQ

Learning Objective: Trainees will be able to use the advanced features within ACQ (for complex VSP surveys), and the supplementary MIRFCOPY and WELLTRAK software.

Topics:

- Logs
- Vibroseis
 - Configuration for Vibroseis sources
 - Moving versus static sources
 - Walkaway sources
- Complex Geometries
- MIRF Copy
 - Configuring MIRFCOPY
 - Using MIRFCOPY with DVD-RAM
 - Using MIRFCOPY with ACQ simulator
- WELLTRAK
 - Configuring WELLTRAK
 - Importing deviation data into WELLTRAK
 - Editing WELLTRAK data
 - Interaction between ACQ and the WELLTRAK database



Module Overview

This module is aimed at Field Engineers and Geoscientists who wish to acquire introductory practical experience deploying ASL borehole seismic equipment within a well. Trainees will acquire a simple shallow well rig source VSP and learn safe deployment/rig out procedures.

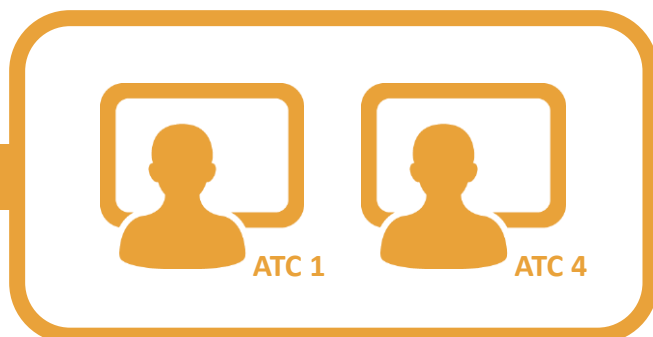
Difficulty: Foundation

M7.1 Configuration of Geochain /Geochain Slim

Learning Objective: Trainees will be able to configure the Geochain and Geochain Slim on the surface, and prepare the tools for downhole operation.

Topics:

- Connection for Workshop Testing
 - Correct orientation of TAS and ASR/GSR
 - Use of link cables
 - Use of the wireline simulator
- Connecting a System to a Wireline
 - Wireline requirement
 - Wireline testing
 - Correct installation of GSP and GPP



LEADERS IN BOREHOLE SEISMIC TECHNOLOGY

M7.2 Configuration of Sources

Learning Objective: Trainees will be able to configure the sources using the GSP and RSS-2 surface panels (optional).

Topics:

- Interfacing to Sources and Source Controllers
 - Single airgun operation
 - GSPIO card capabilities and functionality
 - Interfacing to vibrator controllers
 - Interfacing to explosive blaster
 - Interfacing to multiple airgun controllers
- Configuration of Remote Multiple Sources Using RSS-2 (optional)
 - Modes of operation
 - GSP synchronisation
 - RSS-2 (Master/Slave)
 - Analogue hydrophone adaptor (AHA)
 - Source interface unit

M7.3 Acquiring a Real ZVSP at Avalon Test Well

Learning Objective: Trainees will carry out practical exercise were they assemble the receivers and surface panels, and carry out a ZVSP survey of the Avalon Testing Well.

Topics:

- Surface Set Up
 - Assembly of receivers on surface
 - Connect to ITCs and Winch Unit wireline
 - Surface panel set up and interface
 - Interface of land spot Sleeve Gun to GSP (either local or using RSS-2)
- Downhole Acquisition
 - System diagnostics using ACQ software
 - Lower tools and acquire common depth stack ZVSP from TD surface
 - Safe rig out procedures
 - Perform routine maintenance checks and service



Module Overview

This module is aimed at Engineers and Geoscientists who wish to have a foundation appraisal of VSP dataset characteristics and basic processing steps, and have a comprehensive understanding of how to use VSProwess to QC, pre-process and present VSP data.

- **Difficulty: Intermediate**
- **Duration: 2-3 days**
- **Group Size: Max 8 persons (Recommended 4-6).**
- **Accommodation: Complementary accommodation at Somerton staff house for up to 6 persons (subject to availability).**
- **Prerequisites: Foundation understanding of Borehole Seismic Acquisition methods. No prior experience of VSProwess required.**
- **Trainees are required to bring a laptop PC.**

M8.1 Introducing/Refreshing Basic VSP Processing Theory

Learning Objective: Refresher - Trainees will have an introductory understanding of Borehole Seismic applications and will be able to identify the key features and processing steps of a VSP dataset.

Topics:

- | | |
|--|--|
| <ul style="list-style-type: none"> • Introduction to check shot surveys and VSP • Application of borehole seismic surveys • Introduction of Velocity Analysis • Check shot survey transit times, interval velocity and average velocities • Understanding elevations and times • VSP processing theory • Identification of VSP events | <ul style="list-style-type: none"> • Primary waves • Multiples • Other VSP events • Preparation of data – General Overview • Separation of upgoing and downgoing wavefields • Collapsing multiple energy • Overview of Corridor Stack and simple inversion steps for final composite display. |
|--|--|



M8.2 VSProwess – A Rig Side Data QC Tool

Learning Objective: Trainees will be able to use industry standard VSProwess to import, configure, manipulate and display VSP plots to aid rig source QC and provide efficient data presentation.

Topics:

- | | |
|--|---|
| <ul style="list-style-type: none"> • Introduction to Data Processing using VSProwess • Software installation • Creating and editing processing routes • Standard routes vs custom routes • Display results • Exploring display options • Display Zoom | <ul style="list-style-type: none"> • Dataset Recovery – PDB Modify • Selecting and Sorting Traces • Spectral analysis tools • Hodogram tools • Frequency domain data (FX and FK) • Printing results |
|--|---|

M8.3 Logs, Data Formats and Data Displays

Learning Objective:

- Trainees will be able to use VSProwess to import, compare and invert external log data for calibration and be able to produce synthetic seismogram composites.
- Trainees will also have a more detailed understanding of SEG-Y data and manipulate headers in order to reliably import 3rd party SEG-Y formats.
- Trainees will finally also be able to and produce a range of VSP plots attributes and profile displays.

Topics:

- | | |
|--|--|
| <ul style="list-style-type: none"> • Introduction to sonic log calibration • Synthetic seismograms • Importing SEG-Y files into VSProwess • Preliminary Work • Establish the trace order • SEG-Y trace header assignments • Constant Values | <ul style="list-style-type: none"> • Trace dependent values in SEG-Y headers • Trace dependent values not in SEG-Y headers • Creating composite displays • Importing data • Formation tops • Printing composites displays • Trace attributes and profile displays |
|--|--|

M8.4 Further Data Processing - an example

Learning Objective: Trainees will have fully processed a simple rig source VSP example dataset demonstrating a detailed understanding of the operators and parameters involved within the pre-processing steps.

Topics:

- | | |
|--|---|
| <ul style="list-style-type: none"> • Preparation of SEG-Y data (client example?) • Recover, Select and sort data • Apply Filters • First Arrival Picking/Stacking • Recover amplitude attenuation by spherical divergence • Separation of upgoing and downgoing wavefields • Blank operators • Remove upwave multiples | <ul style="list-style-type: none"> • Deconvolve operator • Presentation of data • Minimum phase VSP • Inversion and prediction ahead of the bit • Enhancement of data • Rig source vertical well • Vertical incidence deviated well • Comparison with surface seismic data • Suggested displays for report |
|--|---|



Module Overview

This module is aimed at Engineers and Geoscientists who wish to have a foundation appraisal of VSP dataset characteristics and basic processing steps, and have a comprehensive understanding of how to use VSProwess to QC, pre-process and present VSP data.

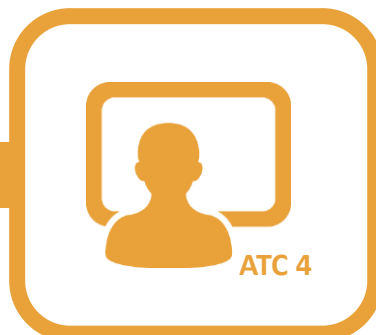
- **Difficulty: Intermediate**
- **Duration: 2-3 days**
- **Group Size: Max 8 persons (Recommended 4-6).**
- **Accommodation: Complementary accommodation at Somerton staff house for up to 6 persons (subject to availability).**
- **Prerequisites: Foundation understanding of Borehole Seismic Acquisition methods. No prior experience of VSProwess required.**
- **Trainees are required to bring a laptop PC.**

M8.1 Introducing/Refreshing Basic VSP Processing Theory

Learning Objective: Refresher - Trainees will have an introductory understanding of Borehole Seismic applications and will be able to identify the key features and processing steps of a VSP dataset.

Topics:

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| <ul style="list-style-type: none"> • Introduction to check shot surveys and VSP • Application of borehole seismic surveys • Introduction of Velocity Analysis • Check shot survey transit times, interval velocity and average velocities • Understanding elevations and times • VSP processing theory • Identification of VSP events | <ul style="list-style-type: none"> • Primary waves • Multiples • Other VSP events • Preparation of data – General Overview • Separation of upgoing and downgoing wavefields • Collapsing multiple energy • Overview of Corridor Stack and simple inversion steps for final composite display. |
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LEADERS IN BOREHOLE SEISMIC TECHNOLOGY

M8.2 VSProwess – A Rig Side Data QC Tool

Learning Objective: Trainees will be able to use industry standard VSProwess to import, configure, manipulate and display VSP plots to aid rig source QC and provide efficient data presentation.

Topics:

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| <ul style="list-style-type: none"> • Introduction to Data Processing using VSProwess • Software installation • Creating and editing processing routes • Standard routes vs custom routes • Display results • Exploring display options • Display Zoom | <ul style="list-style-type: none"> • Dataset Recovery – PDB Modify • Selecting and Sorting Traces • Spectral analysis tools • Hodogram tools • Frequency domain data (FX and FK) • Printing results |
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M8.3 Logs, Data Formats and Data Displays

Learning Objective:

- Trainees will be able to use VSProwess to import, compare and invert external log data for calibration and be able to produce synthetic seismogram composites.
- Trainees will also have a more detailed understanding of SEG-Y data and manipulate headers in order to reliably import 3rd party SEG-Y formats.
- Trainees will finally also be able to and produce a range of VSP plots attributes and profile displays.

Topics:

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| <ul style="list-style-type: none"> • Introduction to sonic log calibration • Synthetic seismograms • Importing SEG-Y files into VSProwess • Preliminary Work • Establish the trace order • SEG-Y trace header assignments • Constant Values | <ul style="list-style-type: none"> • Trace dependent values in SEG-Y headers • Trace dependent values not in SEG-Y headers • Creating composite displays • Importing data • Formation tops • Printing composites displays • Trace attributes and profile displays |
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M8.4 Further Data Processing - an example

Learning Objective: Trainees will have fully processed a simple rig source VSP example dataset demonstrating a detailed understanding of the operators and parameters involved within the pre-processing steps.

Topics:

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| <ul style="list-style-type: none"> • Preparation of SEG-Y data (client example?) • Recover, Select and sort data • Apply Filters • First Arrival Picking/Stacking • Recover amplitude attenuation by spherical divergence • Separation of upgoing and downgoing wavefields • Blank operators • Remove upwave multiples | <ul style="list-style-type: none"> • Deconvolve operator • Presentation of data • Minimum phase VSP • Inversion and prediction ahead of the bit • Enhancement of data • Rig source vertical well • Vertical incidence deviated well • Comparison with surface seismic data • Suggested displays for report |
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