eProcess Technical Training

Course Title:	Facilities Sand Management (FSM)
Duration:	2-3 Days
Tech. Discipline:	(a) Projects, Facilities, & Construction (b) Production & Operations

Ver. Feb-19

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eProcess TECHNOLOGIES

Presenter

Hank Rawlins

eProcess – Technical Director

Metallurgical Engineer (PhD, P.E.)

26 years experience

- Process Engineering of Hydrocarbons/Minerals/Metals
- Facilities Sand Management
- Compact Separation Technology
- Produced Water Treatment

Fifty-seven Publications

Former Chair of SPE Separations Technical Section (STTS)

SPE Distinguished Lecturer (2018-2019)

Luxuriant Facial Hair Club for Scientists (2016 inductee)

Adjunct at Montana Tech

Attendees

Target Audience - Engineers and operators involved with design and operation of facilities (onshore, offshore, or subsea) where sand production is an issue

Learning Objectives:

- Define and characterize oil & gas produced solids - key terms and concepts
- Design/specify piping, valves, and instruments with solids production
- Detail the five-step methodology for solids handling system design - separate, collect, clean, dewater, and transport
- Understand key unit processes: liquid desander, multiphase (wellhead) desander, screen-filters, cyclonic jetting, and sand cleaning systems
- Identify a proper solids disposal route
- Design a dewatering and transport system to meet disposal requirements

Course Description

- Facilities Sand Management ensures sustained hydrocarbon production when particulate solids are present, while minimizing the impact of these produced solids on surface equipment.
- Inclusionary sand management is based on the paradigm that all oil & gas wells produce sand, either now or in the future, and deals with co-production of fluids and solids.
- A solids handling methodology incorporating separation, collection, cleaning, dewatering, transport, and disposal into new or existing facilities simplifies production operations, extends facilities life, restarts shut-in wells, can improve total hydrocarbon recovery, and allows sustainable hydrocarbon production.

Module Overview

Module	Title
FSM-M1	Introduction to Facilities Sand Management
FSM-M2	The Nature of Solids
FSM-M3	Solids Handling
FSM-M4	Liquid Desander
FSM-M5	Multiphase Desander
FSM-M6	Wellhead Screen-Filters
FSM-M7	Separator Solids Removal and Cyclonic Jetting
FSM-M8	Sand Cleaning
FSM-M9	Solids Dewatering, Transport, and Disposal
FSM-M10	Subsea Sand Management
FSM-M11	Heavy Oil & Viscous Fluid Sand Management

Requirements

Participants should be familiar with oil and water treatment equipment, processes and systems, especially separations technologies

Familiarity with mechanical design including ASME Section VIII for Pressure Vessels, ASME B31.3 for Process Piping, and API-6A for Wellhead Equipment would be useful

Attendees need to bring relevant facilities designs and sand production problems to use as in-class exercises

This is an intermediate to advanced course

Two Day Course Schedule

Day 1 (Example)

Morning Session - 08:00 - 11:30		
Start	Stop	Activity
8:00 AM	8:30 AM	Registration
8:30 AM	8:45 AM	Course Goals, Expectations, Outline, and Teaching Method
8:45 AM	9:00 AM	Student Introduction and FSM Background, Issues, and Learning Goals
9:00 AM	9:30 AM	FSM-M1: Introduction to Facilities Sand Management
9:30 AM	9:45 AM	Break
9:45 AM	11:00 AM	FSM-M2: The Nature of Solids, Part 1
11:00 AM	11:30 AM	Exercise 1: Using participant or instructor provided data
11:30 AM	1:00 PM	Lunch
Afternoon Session - 1:00 PM - 5:00 PM		
1:00 PM	2:00 PM	FSM-M2: The Nature of Solids, Part 2
2:00 PM	2:45 PM	FSM-M3: Solids Handling
2:45 PM	3:00 PM	Exercise 2: Using participant or instructor provided data
3:00 PM	3:15 PM	Break
3:15 PM	3:30 PM	Case Studies
3:30 PM	4:30 PM	FSM-M9: Solids Dewatering, Transport, and Disposal
4:30 PM	5:00 PM	Disussion, Review Expectations, and Feedback

Two Day Course Schedule

Day 2 (Example)

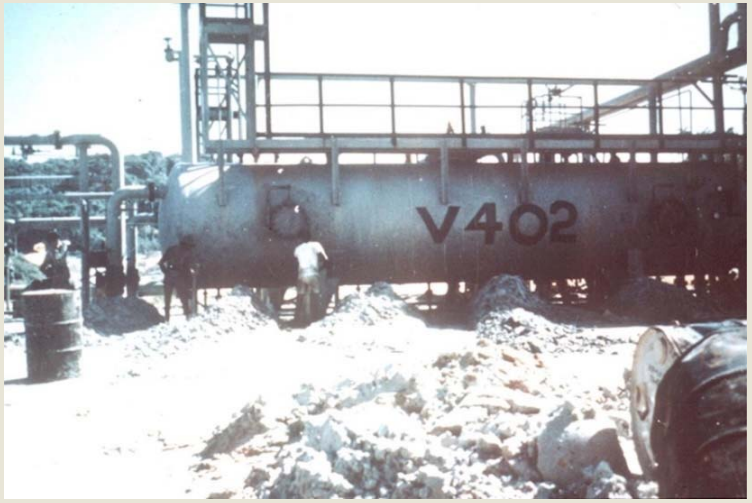
Morning Session - 08:00 - 11:30		
Start	Stop	Activity
8:00 AM	8:30 AM	Review, Q&A, Goals for day
8:30 AM	10:00 AM	FSM-M4: Liquid Desander
10:00 AM	10:15 AM	Break
10:15 AM	11:15 AM	FSM-M5: Multiphase Desander
11:15 AM	11:30 AM	Exercise 3: using participant or instructor provided data
11:30 AM	1:00 PM	Lunch
Afternoon Session - 1:00 PM - 5:00 PM		
1:00 PM	1:45 PM	Elective 1: (Participants Choice)
1:45 PM	2:00 PM	Exercise 4: using participant or instructor provided data
2:00 PM	3:00 PM	Elective 2: (Participants Choice)
3:00 PM	3:30 PM	Break
3:30 PM	4:30 PM	Elective 3: (Participants Choice)
4:30 PM	5:00 PM	Feedback and Course Evaluations

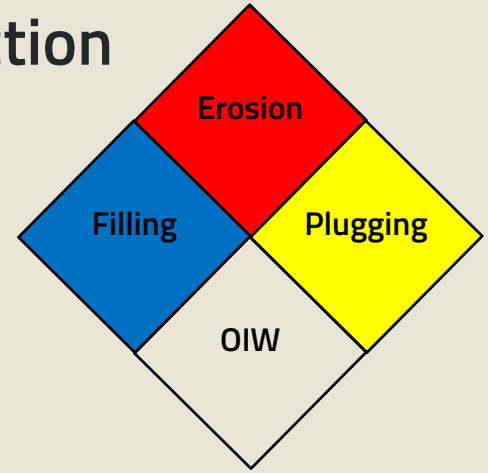
Elective Options:		
	FSM-M6	Wellhead Screen Filter
	FSM-M7	Separator Solids Removal and Cyclonic Jetting
	FSM-M8	Sand Cleaning
	FSM-M10	Subsea Sand Management
	FSM-M11	Heavy Oil & Viscous Fluid Sand Management

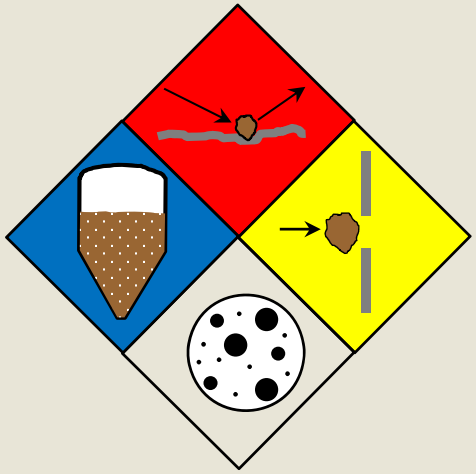
Module Outline

FSM-M1: Introduction to Facilities Sand Management

1. Problems of Produced Solids in Oil & Gas Production
2. Sand Management Options
3. Summary







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Module Outline

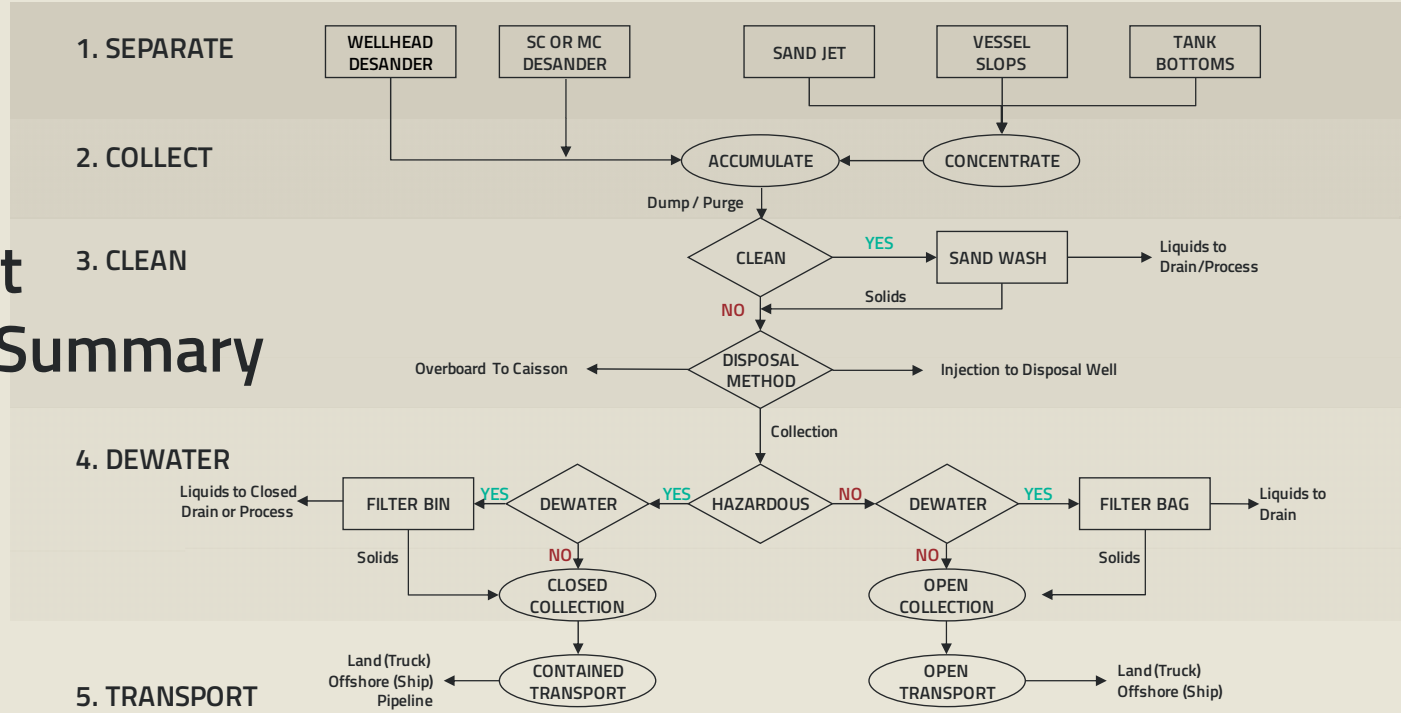
FSM-M2: The Nature of Solids

1. Definition of Oil & Gas Produced Solids
2. Sources of Produced Solids
3. Sampling of Particulate Solids
4. Key Physical Properties of Particulate Solids
5. Key Chemical Properties of Particulate Solids
6. Mineral Properties of Produced Solids
7. Macro vs. Micro Properties
8. Particle Size Measurement and Analysis
9. Calculations and Conversions
10. Particulate Solids Transport
11. Instrumentation and Valves for Solids
12. Critical Sizes of Particulate Solids for Remediation
13. Physical and Chemical Modification of Particulate Solids
14. Dealing with Hazardous Solids in Oil & Gas
15. Summary

Module Outline

FSM-M3: Solids Handling

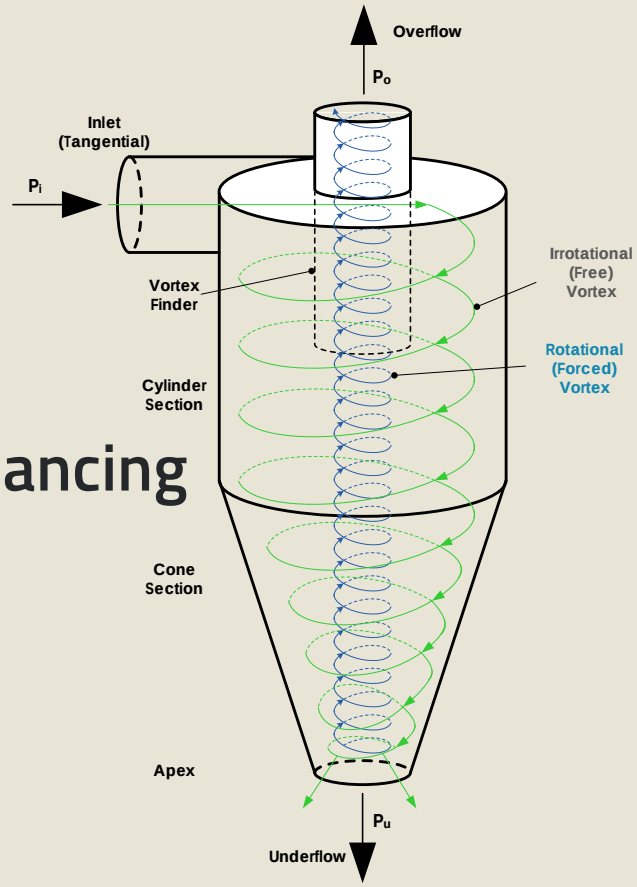
1. Solids Handling Overview
2. Step 1: Separate
3. Step 2: Collect
4. Step 3: Clean
5. Step 4: Dewater
6. Step 5: Transport
7. Solids Handling Summary



Module Outline

FSM-M4: Liquid Desander

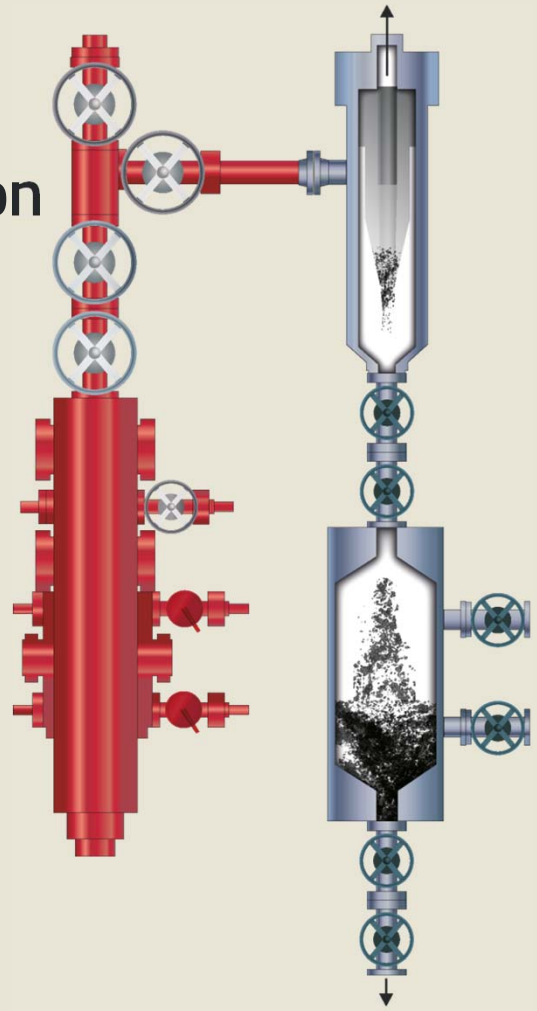
1. Sand Management Options
2. Cyclone Technology
3. Hydrocyclone Technology
4. Liquid Desander Design & Operation
5. Desander Sizing & Selection
6. Flooded Core Hydrocyclone & Apex Flux Balancing
7. Erosion & Material Selection
8. Liquid Desander Operability
9. Liquid Desander Mechanical Design
10. Flow Sheet Design & Skid Layout
11. Case Studies
12. Liquid Desander Summary



Module Outline

FSM-M5: Multiphase Desander

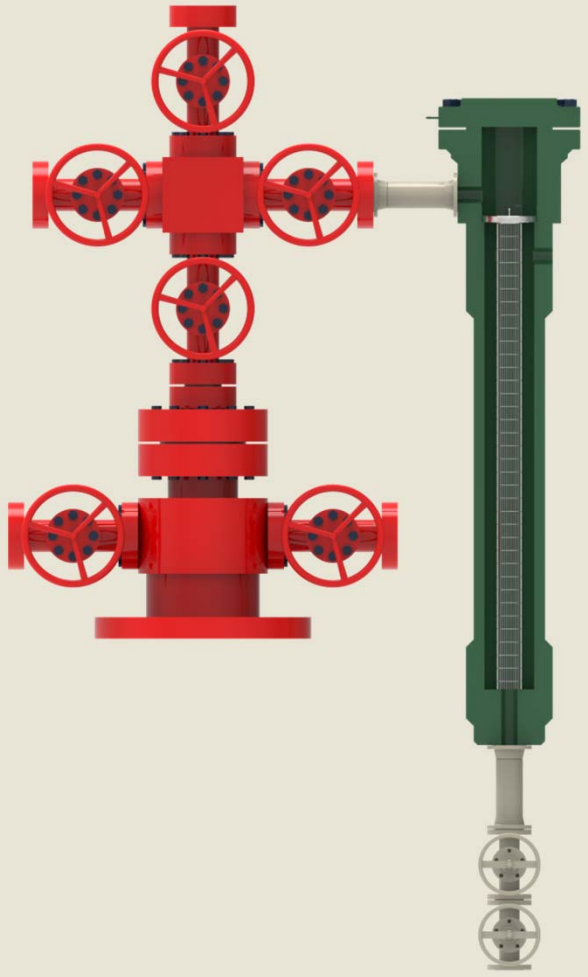
1. Sand Management Options
2. Multiphase Desander Development & Operation
3. Multiphase Desander Sizing & Selection
4. Multiphase Desander Operability
5. Multiphase Desander Mechanical Design
6. Flow Sheet Design & Skid Layout
7. Case Studies
8. Multiphase Desander Summary



Module Outline

FSM-M6: Wellhead Screen-Filters

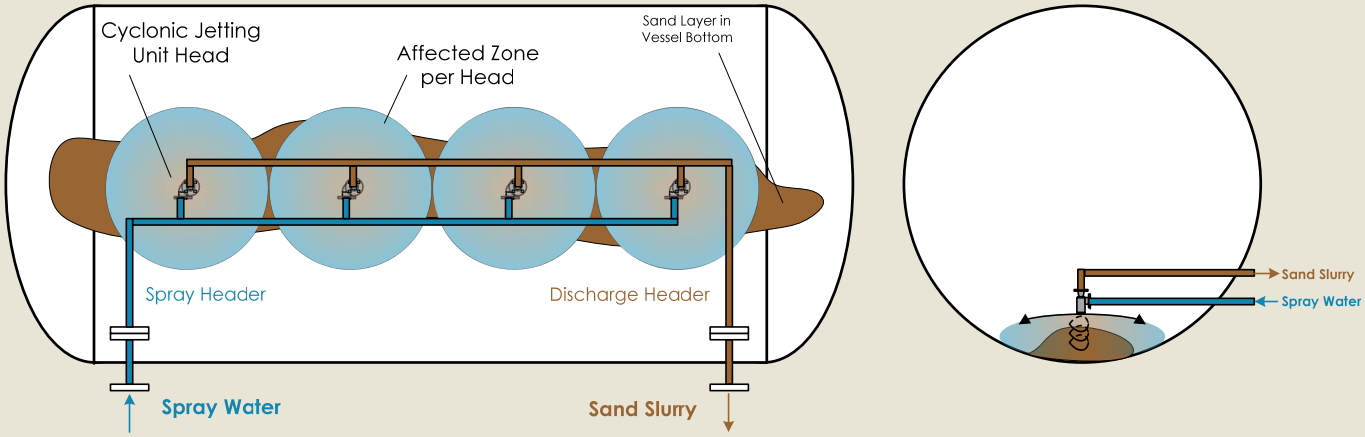
1. Sand Management Options
2. Wellhead Screen-Filter
3. WSF Sizing & Selection
4. WSF Operability
5. WSF Mechanical Design
6. Flowsheet Design & Skid Layout
7. Case Studies
8. Summary



Module Outline

FSM-M7: Separator Solids Removal and Cyclonic Jetting

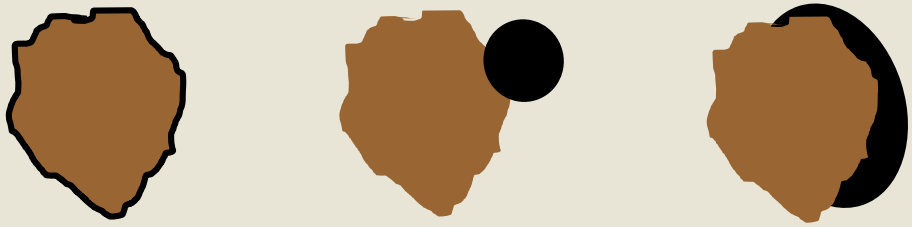
1. Sand Management Options
2. Particulate Solids Transport in Low Velocity Zones
3. Traditional Jetting System Design
4. Cyclonic Jetting System Design
5. Slurry Transport and Handling
6. System Integration
7. Summary



Module Outline

FSM-M8: Sand Cleaning

1. Sand Management Options
2. Oil & Gas Solids Cleaning Overview
3. Cyclonic Cleaning System Design
4. Case Studies
5. Summary



Film Encapsulation | Point Attachment | Partial Encapsulation

Module Outline

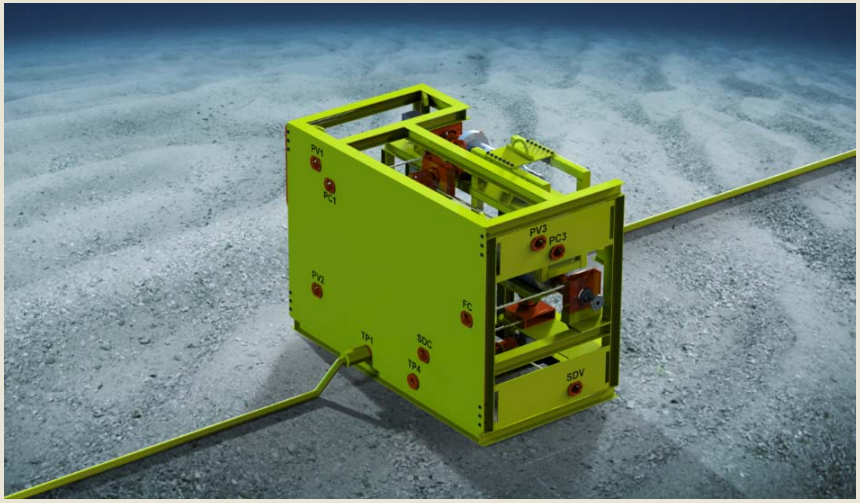
FSM-M9: Solids Dewatering, Transport, & Disposal

1. Sand Management Options
2. Role of Dewatering, Transport, & Disposal
3. Slurry Dewatering
4. Solids Transport
5. Solids Disposal
6. Summary

Module Outline

FSM-M10: Subsea Sand Management

1. Subsea Production Overview
2. Problems Caused by Sand in Subsea Processing
3. Subsea Sand Management
4. Survey of Existing Installations
5. Equipment for Separating Sand on the Seafloor
6. The Subsea Sand Management Challenge
7. Summary



Module Outline

FSM-M11: Heavy Oil & Viscous Fluid Sand Management

1. Heavy Oil Production, Processing, and Properties
2. Other Viscous Fluids in Oil Production & Processing
3. Effects of Viscosity and Density
4. Sand Removal and Processing for Heavy Oil
5. Summary