

# Inspection Output (IOR)

10-20-15 15:48 RCVD

*Tom Ford*  
*Approved 11/30/15*

*No Violations*

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## Inspection Information

Inspection Name Jackson Prairie Storage and Transmission	Operator(s) PUGET SOUND ENERGY (22189) Lead David Cullom Supervisor David Mulligan, Joe Subsits Director Chris Hoidal, David D Lykken	Plan Submitted 06/30/2015 Plan Approval 07/01/2015 by Joe Subsits All Activity Start 08/25/2015 All Activity End 08/28/2015 Inspection Submitted 07/01/2015 Inspection Approval 10/20/2015 by David Mulligan
Status LOCKED		
Start Year 2015		
System Type GT		
Protocol Set ID GT.2015.01		

## Inspection Summary

Inspection dates: August 25-28 and September, 2015

AFODs: 5

Summary:

No violations found.

Jackson Prairie is an underground natural gas storage repository. Natural gas is stored underground in a natural sandstone salt-water aquifer. The primary storage reservoir is a geological anticline approximately 1000-3000 feet below the local ground surface. The gas storage occurs as natural gas is forced down through well bores that penetrate the aforementioned sandstone aquifer. There the natural gas displaces the in-situ salt water. The gas molecules then reside there occupying the pore space between the sand grains. This pore space is approximately 30% of the bulk rock volume. This gas is retained in the sandstone by gravity effects and pressure. An impermeable shale layer on top of the sand prevents the upward migration of the gas while displaced water blocks the continued downward gas movement due to fluid density differentials and absolute aquifer pressure. The pressurized gas remains in this rock pore space until it is withdrawn for future use. That is a brief summary of the storage on the reservoir level.

To enable that basic storage mechanism requires a fairly extensive system of equipment, gas pipelines and wells. The mechanical connection of Jackson Prairie to the Williams Gas Pipeline System starts with 4 interconnect lines that run approximately 1.5 miles West to East from the Chehalis Meter Station to the West side of the Jackson Prairie Gas Processing Plant. These lines are 14, 16, 20 and 24 inches in diameter. They parallel one another along a common right of way. The lines have been added over the years as the Project has achieved greater gas delivery capacity.

The gas processing plant performs four basic functions. It filters the gas to remove aerosol liquids and particulate matter. Depending on pressure differentials between the storage reservoir and pipeline, boost compressors are sometimes employed to move the gas into or out of storage. Control valves are also employed to adjust the gas flow rate in and out of the storage field especially when no compression is required. Finally, since the gas is stored in an aquifer sand body, the gas must be dehydrated to remove excess water vapor from the stream. The following paragraphs will elaborate each basic process.

Filtration and solid-liquid knock out is accomplished with basically two classes of equipment. They use vortex separators to remove solids and free liquids via dynamic separation from the flowing gas stream. In addition, the Project employs large filter coalcsing units to filter 100 per cent of the gas moving in and out of the field. All of these vessels are rated for 1000 psi. (From previous audit documentation)

Currently, the plant houses compressors that boost the gas pressure to facilitate gas movement in and out of the project. The units range in power from 7,500 down to 800 horsepower. Jet turbines drive the most powerful units. A v12 reciprocating engine powers the smallest unit. All of the units are fired by natural gas fuel. They are interconnected in a parallel arrangement to provide incremental boosts in production or injection gas rate as necessary.

The plant has a myriad of interconnecting piping and valves to distribute the gas through the filtering, compression and dehydrating equipment. This movement is controlled by a central PLC system with manual override ability. The valve system is also occupied to a safety control system that enables a rapid block and bleed of the plant proper in the event of an emergency (fire, line break, etc)

The gas-drying portion of the facility consists of TEG regeneration units coupled to bubble tray contactor towers. Basically the process consists of dripping dry tri-ethylene glycol (TEG) down through bubble trays in the high-pressure contactor towers. At the same time the wet gas from the storage aquifer is countered flowed up through the tower. The TEG acts as a desiccant and removes a significant portion of the water vapor from the natural gas stream. The dried gas is pumped back into the pipeline system for delivery to end-users. The wet TEG is heated to drive off the water vapor and re-circulated in a loop process to provide continuous drying of the gas.

The connection from the gas storage reservoir to the plants is completed by gas gathering system and gas injection withdrawal wells. The gathering system consists of a basic 16 inch diameter loop system branching off to the individual wells with smaller individual interconnecting lines. Each gas injection withdrawal well also has control and isolation valves as well as a free water separator. Depending on the gas supply and demand condition, gas moves in or out of the underground reservoir through this gathering system.

I confirmed MAOP records for the 14, 16, 20, and 24 inch lines running to the Williams Compressor Station using historical records PSE had collected back to August 16, 1965. It is recommended to continue the MAOP confirmation for all jurisdictional line pipe segments and pressure vessels. I followed up on slug catcher modifications and issues from past inspections dating back to 2001.  
-DC

## Scope (Assets)

Short # Label	Long Label	Asset Type	Asset IDs	Excluded Topics	Planned	Required	Inspected	Total	Required % Complete
1. Unit 33875	WA-UTC/JACKSON PRAIRE STORAGE FACILITY	unit	33875	--	194	194	194	194	100.0%

a. *Percent completion excludes unanswered questions planned as "always observe".*

## Plans

Plan # Assets	Focus Directives	Involved Groups/Subgroups	Qst Type(s)	Extent Notes
1. Unit 33875	Small System Key Risks, OQ Protocol 9, Gas Storage Inspection, GT OQ	ALO, AR, CR, DC, EP, FS, IM, MO, PD, RPT, SRN, TD, TQ, GENERIC	P, R, O, S	Detail

## Plan Implementations

Activity #	Activity Name	SMART Act#	Start Date	End Date	Focus Directives	Involved Groups/Subgroups	Assets	Qst Type(s)	Planned	Required	Inspected	Total	Required % Complete
1.	Inspection	151416 151417	08/25/2015	08/28/2015	n/a	all planned questions	Unit 33875	all types	194	194	194	194	100.0%

- a. Since questions may be implemented in multiple activities, but answered only once, questions may be represented more than once in this table.
- b. Percent completion excludes unanswered questions planned as "always observe".

## Forms

No.	Entity	Form Name	Status	Date Completed	Activity Name	Asset
1.	Attendance List	Contact List	COMPLETED	10/20/2015	Inspection	Unit 33875
2.	Drug and Alcohol	2015 Drug and Alcohol Form	COMPLETED	10/20/2015	Inspection	Unit 33875

## Results (Unsat,Concern values, 0 results)

This inspection has no matching Results.

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Report Parameters: Results: Unsat,Concern

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