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EJECTOR INSTALLATION FOR CASING VAPOR RECOVERY

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Introduction

Platform Emmy, an offshore oil and gas production platform located approximately 1 1/2 miles offshore in the Huntington Beach Field, produces natural gas from the 'C' zone, a layer of sweet, shallow gas located approximately 800' directly below the platform. The 'C' zone wells have a 8ITP of <300 PSIG.

Gas from the 'C' zone is combined with sour (>800 PPM H2S) casinghead gas from the oil wells and sent to the onshore gas processing facility via an 8" pipeline operating at 30 PSIG. No compression facilities are located on the platform. Total gas production from the platform was 1.5 MMSCFD, constrained by the back pressure the 'C' zone well put on the production well casings (Figure 1).

An ejector was used instead of a sour gas CVR compressor at the tie-in point between the casing gas system and the flowline from the gas well, utilizing the 'C' zone gas production at 200 PSIG as a motive source for the ejector to reduce the overall casing pressures on the platform (Figure 2). The result allowed an additional gas well to come on production, increasing the total gas production from the platform to 5 MMSCFD. In addition, the ejector allowed the pipeline pressure to increase to 40 PSIG while reducing production well casing pressures to 20 PSIG. The ejector performs the primary function of compressing the low pressure stream utilizing the energy normally lost in the production choke.

The total installed cost of the unit on Platform Emmy was $ 25M, and operating costs are negligible. The installed cost of a comparable CVR compressor with permitting for California, new source review from South Coast Air Quality Management District (SCAQMD) and Best Available Control Technology (BACT) for fugitive emissions would have been in excess of $100M.

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Our installation was taken from conception to completion in eight weeks. Permitting alone for the compression skid would have taken at least six months.

Ejector Description

Jet type ejector devices have been used for years in a wide variety of applications. Typical applications utilize high pressure (>200 psig) steam or gas as a motive source to produce a siphon or suction. The device is very simple in construction, has no moving parts and can be constructed from practically any machinable material. Since they require little attention and have no electrical components, they can be located in remote areas and hazardous locations.

Principle of Operation

The device consists of three basic components: the nozzle, the body and the diffuser (Figure 3). A high pressure motive source enters the body through the nozzle, converting the pressure into a sonic velocity jet. The jet produces a low pressure in the body, entraining the lower pressure suction stream. The diffuser converts the velocity head of the gas mixture to a static head at an intermediate pressure.

Jet type devices can be broken down into two basic categories baaed on the type of performance: critical and noncritical. Noncritical performance means the diffuser velocity is leas than critical, or Mach 1. Critical performance is a condition where the diffuser velocity reaches Mach 1.

Application

Generally, if the absolute pressure of the discharge of the unit is less than 1.8 times the absolute pressure of the suction, noncritical performance can be maintained. With noncritical performance, the suction pressure of the unit can be controlled by varying the motive flow.

Critical performance occurs when compression ratios exceed 1.8 to 2.0. With critical performance, the suction pressure of the unit cannot be controlled by varying the motive flow without introducing an artificial pressure drop in the suction line or adding a second stage. The efficiency of critical jets is also very dependant on motive pressure. Generally the higher the motive pressure the more efficient the unit. For critical jets with compression ratios greater than 4:1, motive pressures should be greater than seven times the discharge pressure. In our application, we achieved a 2:1 suction to discharge compression ratio with a motive pressure five times the discharge pressure.

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Conclusion

Ejectors have a limited but very cost effective application in the oil industry, but each device has a character of its own and operates within a specific design window. As with other types of compression and pumping equipment, vendors are a great resource for information.

References

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3. Standards for Steam Jet Ejectors, Heat Exchanger Institute

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Figure 1
Process Flow Diagram
Existing Gas System
Platform Emmy

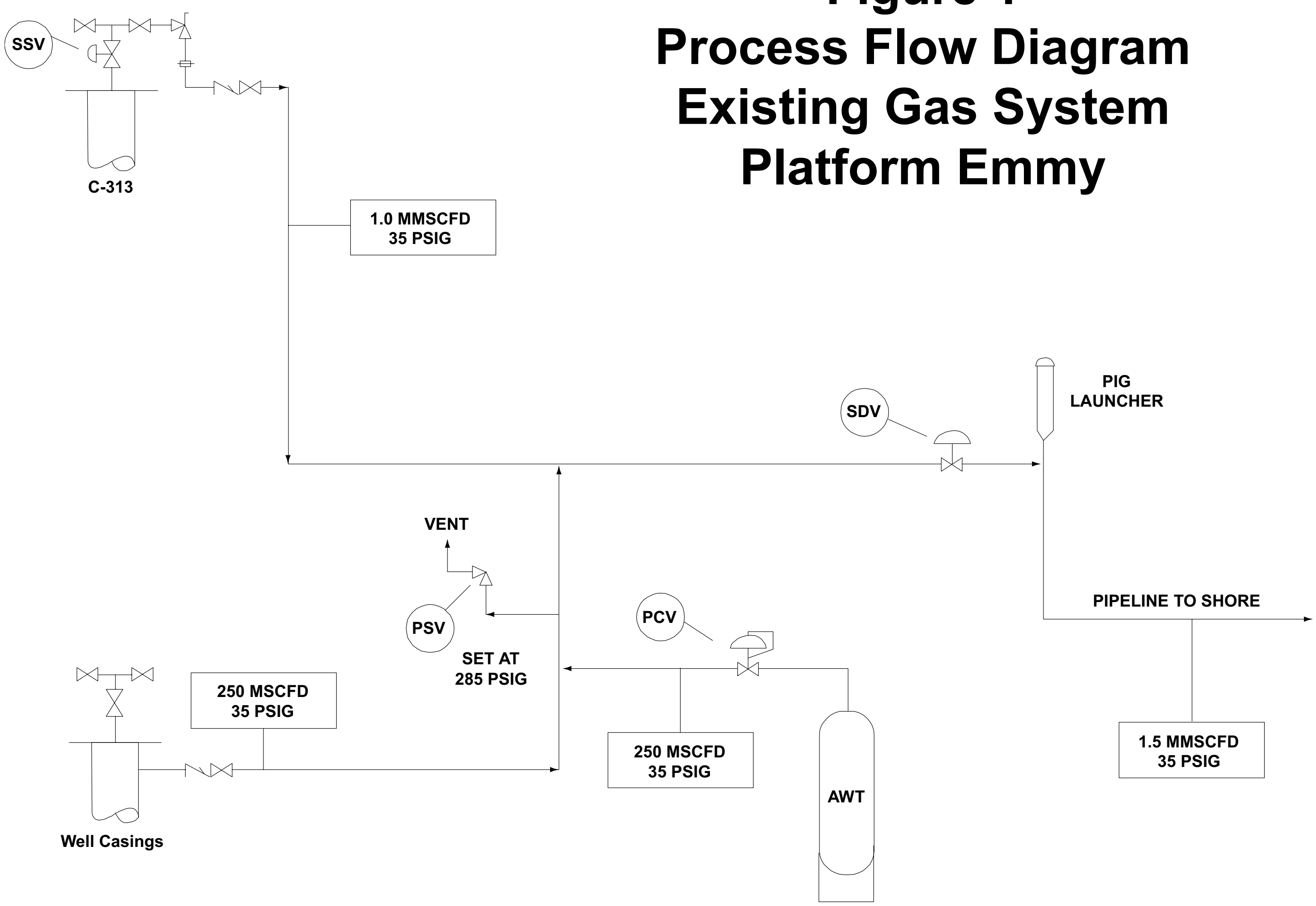

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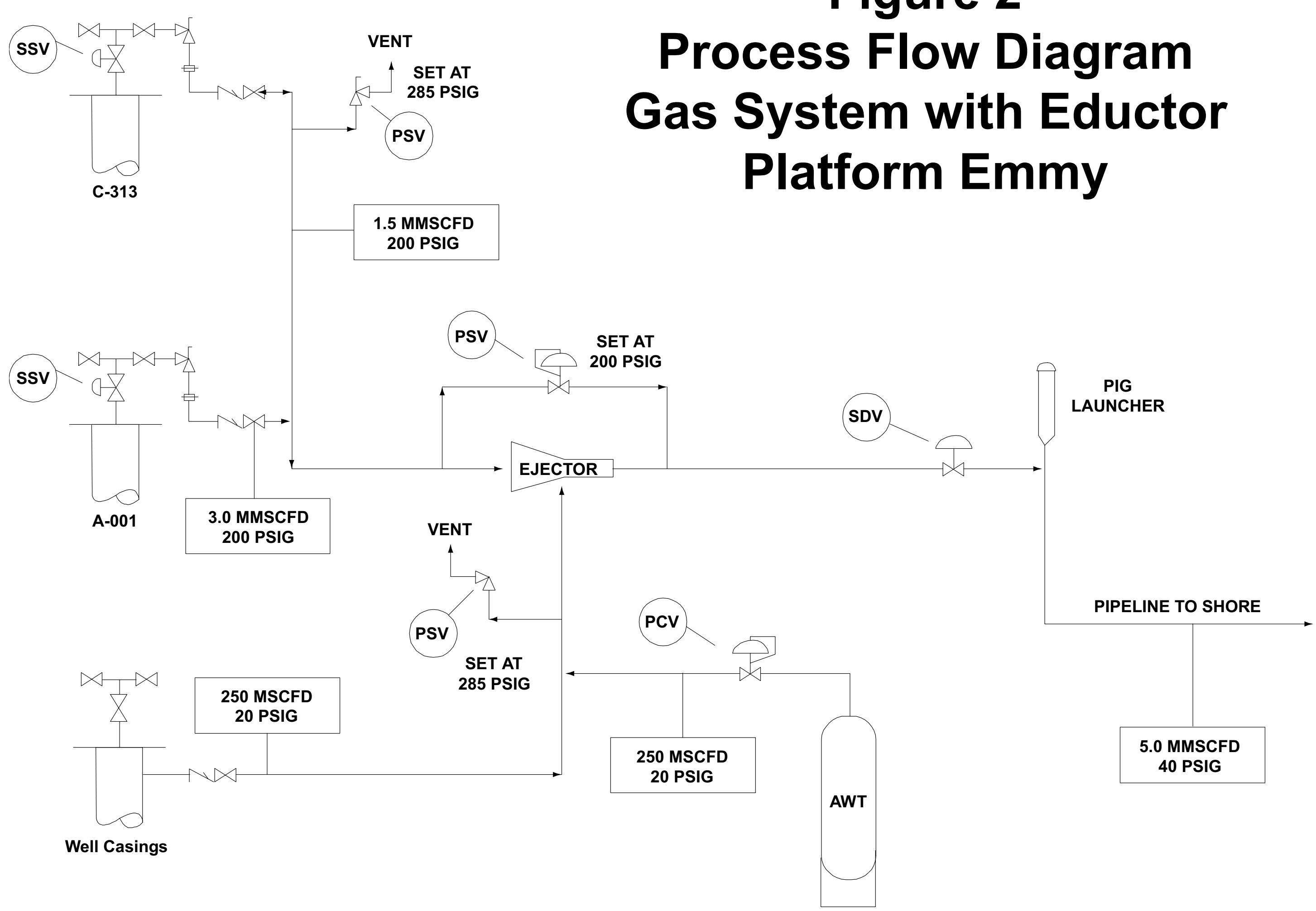
Figure 2
Process Flow Diagram
Gas System with Eductor
Platform Emmy



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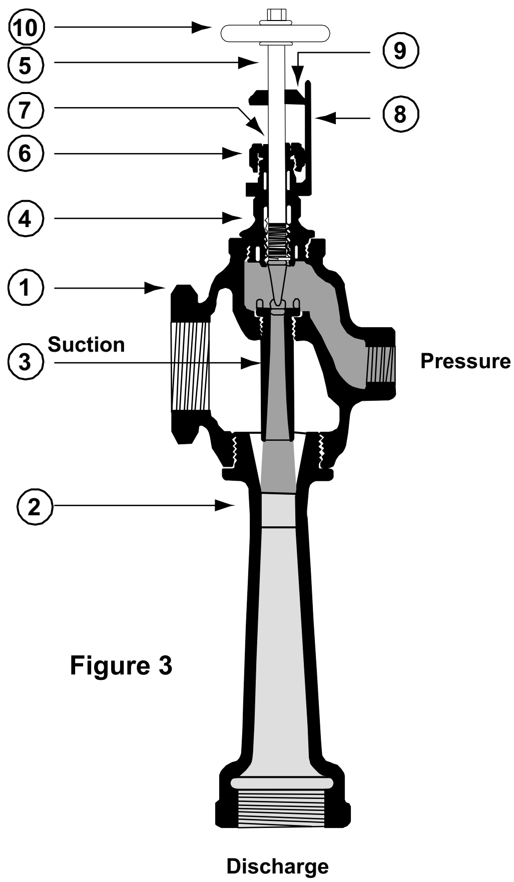

Figure 3

Mark	Description
1	BODY
2	DIFFUSER
3	NOZZLE
4	STUFFING BOX
5	SPINDLE
6	STUFFING BOX NUT
7	FOLLOWER
8	INDICATOR ARM
9	INDICATOR
10	HANDWHEEL

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