RAE Engineering and Inspection Ltd.
4810-93 Street, Edmonton, Alberta T6E 5M4
Phone: (780) 469-2401 Fax: (780) 468-2422

Field Inspection Report

Report No: CMH001886

Client	Petrogas Energy Services Ltd.	**Inspection Date**	May 10, 2010		
Prov. Reg. #	AB 2501321	**Inspection Type**	VE / VI / UT / MT		
Equipment Type	Ethane Bullet	**LSD**	AB SW-24-055-22W4		
Tag/Equip.	V-303	**Location**	Fort Saskatchewan		
Status	Not in Service	**Area**			
Manufacturer	Cessco Fabrication & Engineering Ltd	**Year Built**	1989		
Serial Number	3142	**Service**	Propane		
CRN #	H5920.2	**Manway**	30" Manway on the South Head		
Comp/Unit Id	SV-17.109	**Coating**			
Nat.Board #		**Owned By**	Petrogas Energy Services Ltd.		
Interim Insp'n	2015	**Interim Insp Type**	VE / UT		
Next Inspection	2020	**Next Insp Type**	VE / VI / UT / MT		
Length	1108 in	**Height**			
Volume	10897 ft³	**RT**	1	**HT**	YES
Job No.	10-1093	**Client Reference**			
Foreman	Greg Arbuckle	**DownholdLSD**			
ABSA	**Plant:** H **Vessel:** R **Process:** G	**Special:** B	**ASME**	Sec. VIII div. 1	
History Log	AB-10 - Vessel NIS - dated and entered March 4, 2016.				

Component	Vessel Shell		
MAWP	451.00 PSI @ 200 °F	**MDMT**	-20 °F @ 451.000 PSI
Material	SA-516-70N	**Material Thickness**	2 in
Diameter	144 in	**Length**	
Corrosion Allowance			

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Component	Vessel Heads		
Material	SA-516-70N	**Material Thickness**	1.95 in
Corrosion Allowance			

Comments

The bullet is located at the Petrogas Energy Services LSD: SW-24-055-22W4 location just north of Fort Saskatchewan. The bullet is one of twelve bullets at this location. This bullet is located in the bullet farm which is located in the middle of the site.

This bullet was inspected as per RAE Inspection Procedures:

INS-624B - Inspection - Unfired Pressure Vessels
INS-660B - Inspection of Storage Bullets

Volume: 10897 ft3
Weight: 338000 lbs

Note: diameter given is inside diameter of the bullet.

Building Observations

This bullet is located outside of any building structures as larger diameter storage bullets typically are. This is a newly installed bullet on site. No evidence of leakage or garbage was found in the vicinity of the bullet.

Piping Observations

There is currently no piping attached to this bullet. There are multiple nozzles for piping on the bullet (see Internal Inspection details for the layout). The piping may not be insulated upon commissioning. The piping will be painted upon commissioning. The piping will come off the common pipe rack on the north side of the bullet. There are fully insulated nozzles for piping on top. The nozzles on the bottom are not insulated (may have had the insulation removed). The vessel does not have a sample nozzle like the other bullets.

PSV Observations

At the time of inspection, no PSV was in place on the bullet. The details for the PSV below will be verified via visual inspection in the coming months.

The PSV is located on the first shell section from the north end. The PSV has the correct set pressure for this bullet There is a valve on the PSV inlet line that is not carsealed in the open position. The PSV will be serviced the same year as the current inspection. There is currently no platform access to the PSVs. The PSV(s) vent(s) to atmosphere. There is only one PSV associated to this bullet. The PSV discharge has a vertical leg with no cap and no weep hole. The PSV on the outlet piping is stainless steel (unknown as to why). The seal wire was broken on the PSV. No service tag was attached to the PSV.

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External Observations

The bullet is supported by two channel supports which are bolted to I-Beams raising the bullet approximately 8 ft off the ground (north and south sides). The channel supports are (most likely) stitch welded to the bullet on shell sections 1 and 10 on the north and south ends (covered by insulation so no details). The I-Beams were found in very good condition with no major dents / deformities found. Each I-Beam was supported by six pile supports. The pile supports were tack welded to the I-beams. The slide end support was located on the south side of the bullet which is away from the piping. The slide end was double bolted (2 of the 4 bolts was loose at the time of inspection).

Structural attachments to the bullet include brackets for supporting a ladder / platform to access the PSVs on the north end of the vessel. The bullet also has an 30" manway on the middle of the south head of the vessel. The bullet is a 92 foot long vessel with a total of 10 shell sections. Each section appears to be of equal length. The heads are single piece elliptical heads. Both heads were found to be in good condition with no major dents or deformities. The vessel is fully insulated and it appears in fair condition. There are two insulation band cutouts at approx 1/3 length and the 2/3 length down the bullet (most likely for moving/lifting). The cutouts were not cut in a way to prevent under-insulation corrosion. There was one box cutout on the underside of the inlet of the vessel and it was also not cut to prevent under-insulation corrosion. There were multiple locations on the shell where dents or deformities were found in the insulation / cladding, but none seemed to have gone through to the shell. Some mid-shell UT ports were also identified on the vessel. Some under-insulation corrosion appears to minor. There is some blistering and general corrosion on exposed surfaces (no concern).

Note: The upper 20-30% of the vessel was not visible from the ground and was not verified during the inspection. At this point there is no major concern given the condition of the rest of the vessel.

The shell to shell external inspection of the bullet could not be performed as the bullet was fully insulated.

All nozzle locations will be identified in the internal inspection details.

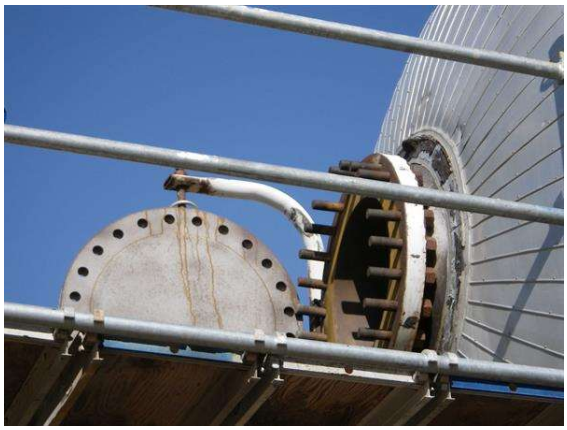
Figure: 1

Vessel Nameplate

Figure: 2

General View of the Vessel

Figure: 3



General View of the Manway

Figure: 4

General View of the Ladder attachment brackets

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Internal Observations

The bullet internal access was through the south head manway. The internal inspection is listed as starting on the north side (north head) and then through shells 1-10 (north to south).

All of the seam welds have been blasted. The welds are covered in white paint due to previous MPI being performed. Where all of the welds were blasted, the scale was removed from all welds. Some general surface roughness and general surface corrosion was noted (except as noted below).

This vessel was cleaned well. The heaviest scale was still noted near the top of the bullet (same as others).

Note: All clock references are when facing south (looking towards last shell).

The following details the inner shell and weld conditions:

North Head: The head has one instrumentation port. The head section is a single piece elliptical head with the first circumferential weld on the south end of it. There was a fair amount of plat formation damage and under-scale pitting noted. The worst location of 12" east of the centerline and 4.5 ft up the head and was noted to be 1.5" x 1.5". The head was not in the best condition (all damage most likely from fabrication). No corrosion was was noted on the bottom of the head.

Shell Section 1: This shell section has the first and second circumferential welds on either end of it. The first longitudinal weld is also located on this shell section. The shell is equipped with a main nozzle at the 6 o'clock position with a vortex breaker and 3 bridle nozzzles . Circ 1 weld appears in good condition visually with some minor surface porosity grinder marks, grind out marks, some weld concavity and some minor plate misalignment. Long weld 1 appeared in good condition visually with some minor surface porosity, grinder marks, grind out marks and general surface corrosion. The shell section appeared in good condition with a few roller marks found and several locations of fabrication imperfections. Some mechanical damage was also noted on this shell section. No corrosion was noted in this shell section.

Shell Section 2: This shell section has the second and third circumferential welds on either end of it. The second longitudinal weld is also located on this shell section. This shell section has no nozzles. Circ weld 2 appears in good condition visually with some grinder marks, grind out marks and some general surface corrosion found. Long weld 2 appeared in good condition visually. Some mechanically induced lines parallel to the circumferential weld 2 were found (less and 1/16" in depth) away from the weld and the heat affected zone of the weld (no concern). Some fabrication marks were noted for this shell section. No corrosionw was noted in this section.

Shell Section 3: This shell section has the third and fourth circumferential welds on either end of it. The third longitudinal weld is also located on this shell section. This shell section has no nozzles. Circ weld 3 appears in good condition visually with some grinder marks and grind out marks found. Grinder marks and grind out marks were noted near long weld 3. A fair amount of mechanical marks and fabrication issues noted on this shell. No corrosion was noted in this section.

Shell Section 4: This shell section has the fourth and fifth circumferential welds on either end of it. The fourth longitudinal weld is also located on this shell section. There are no nozzles in this section but it does have a separation plate (see below). The welds appear in good condition visually with some grinder marks and grind out makrs, general surface corrosion and what appears to be gouging off of the weld (9 o'clock position) on circ weld 4. Four plate fabrication inconsistencies were found (1 at the 5 o'clock position and 3 at the 7 o'clock position). They appear to be round tabs from fabrication. Some mechanically induced lines and fabrication marks were noted in this shell section. No corrosion was noted in this shell section.

Shell Section 5: This shell section has the fifth and sixth circumferential welds on either end of it. The fifth longitudinal weld is also located on this shell section. This shell section has no nozzles. The welds appear in good condition visually. Some grinder marks and grind out markswere found on and around long weld 5. The shell section appeared in good condition with some fabrication marks found. Some plate scrapes and mechanical marks were also noted on this shell section along with some general surface corrosion.

Shell Section 6: This shell section has the sixth and seventh circumferential welds on either end of it. The sixth longitudinal weld is also located on this shell section. This shell section has no nozzles. Circ weld 6 appears in good condition visually with some grinder marks and grind out marks found. . Long weld 6 was found to be in good condition visually with undercut and plate grinder marks and scrapes surrounding the weld. The shell section appeared in good condition with some fabrication / mechanical marks found. Some general corrosion was noted in this shell section.

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fabrication / mechanical marks found. Some general corrosion was noted in this shell section.

Shell Section 7: This shell section has the seventh and eighth circumferential welds on either end of it. The seventh longitudinal weld is also located on this shell section. This shell section has no nozzles. The welds appear in good condition visually with some grinder marks and grind out marks on and around circ weld 7. Long weld 7 appeared to have some surface porosity, some slight undercut and some grind out marks. The shell section appeared in good condition with some fabrication /mechanical marks found. Some general corrosion was noted on this shell section.

Shell Section 8: This shell section has the eighth and ninth circumferential welds on either end of it. The eighth longitudinal weld is also located on this shell section. This shell section has no nozzles. Circ weld 8 appears in good condition visually with some grind out marks. Some grind out marks were found on long weld 8. The shell section appeared in good condition with some fabrication /mechanical marks found. Some general corrosion was noted on this shell section.

Shell Section 9: This shell section has the ninth and tenth circumferential welds on either end of it. The ninth longitudinal weld is also located on this shell section. This shell section has no nozzles. Circ weld 9 appeared in good condition visually with some minor undercut and excessive grinding noted. Some weld repairs, grind out marks and excessive grinding were found on long weld 9. Some large fabrication defects were noted at the 3 and 4 o'clock position. Some plate surface damage was noted at the 7 o'clock position. Several large grind areas were noted just below the longitudinal weld. A large plate imperfection was noted above the longitudinal weld. All defects appeared less than 1/16" deep (no concern).

Shell Section 10: This shell section has the tenth and eleventh circumferential welds on either end of it. The tenth longitudinal weld is also located on this shell section. This shell has two larger nozzles and one smaller nozzle on the bottom of the shell. Circ weld 10 appeared in good condition visually with some undercut, grind out marks, surface porosity and indications of plate misalignment. Some weld concacivity was found on long weld 10. Two grind locations were noted at the 4 o'clock position on the shell (most likely due to fabrication). There were several peeling fabrication marks at the 7 o'clock position on the shell. Some general corrosion was noted on this shell section.

South Head: The head has a 30" manway located in its center. The head section has seven attachment welds and the eighteenth circumferential weld on the north end of it. The welds appeared in good condition visually with some weld repair and grind out marks on circ weld 11. The manway weld appeared in good condition visually with some surface porosity, undercut and some grind out marks. There was a fair amount of plat formation damage and under-scale pitting noted (similar to north head, with not as many deep areas noted). The largest indication was found approximately 8 ft up the head and 30" east of the centerline (approx, 1/8" deep and 1" diameter - too high to measure accurately).

The fabrication marks found on the heads are common, but some appear fairly deep. A minimum thickness calculation will be performed and provide with this report. Ultrasonic thickness measurements of the vessel have been performed and are provided in the next section of this report.

Figure: 5

General View of the Shell

Figure: 6

General View of the Head and the Manway Access

Figure: 7

General View of the Bullet

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UT1 Observations

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UT was performed on the heads and shells of the bullet in the following locations with a minimum of 15 readings per each location:

North Head:

Left (N): 2.029 - 2.083 A = 2.081
Center: 2.039 - 2.070 A = 2.052
Right (S): 2.052 - 2.122 A = 2.071

Shell 1:
West Side: 2.028 - 2.034 A = 2.029
East Side: 2.042 - 2.061 A = 2.044

Shell 2:
West Side: 2.029 - 2.041 A = 2.036
East Side: 2.025 - 2.029 A = 2.026

Shell 3:
West Side: 2.009 - 2.013 A = 2.012
East Side: 2.034 - 2.037 A = 2.034

Shell 4:
West Side: 2.019 - 2.023 A = 2.021
East Side: 2.011 - 2.017 A = 2.014

Shell 5:
West Side: 2.018 - 2.021 A = 2.021
East Side: 2.021 - 2.039 A = 2.039

Shell 6:
West Side: 1.999 - 2.006 A = 2.005
East Side: 2.017 - 2.021 A = 2.020

Shell 7:
West Side: 2.029 - 2.029 A = 2.029
East Side: 2.045 - 2.057 A = 2.054

Shell 8:
West Side: 2.022 - 2.028 A = 2.024
East Side: 2.021 - 2.023 A = 2.021

Shell 9:
West Side: 2.038 - 2.045 A = 2.040
East Side: 2.034 - 2.040 A = 2.038

Shell 10:
West Side: 2.025 - 2.033 A = 2.031
East Side: 2.040 - 2.043 A = 2.040

South Head:

Left (N): 2.244 - 2.301 A = 2.252
Center: 2.211 - 2.341 A = 2.313
Right (S): 2.230 - 2.377 A = 2.307

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UT2 Observations

Magnetic Particle Inspection (MT) was performed by Metalogic Inspection Services out of Edmonton, Alberta.

Some indications were found, but were ground out. For further details please see below and please refer to the attached report.

Also attached are the certification tickets for the MT Technicians.

The indication details are as follows:

The associated remedial actions were as follows

General Observations

Generally, the bullet was in good external condition. No visible deterioration of the bullet structure was found. The insulation on the vessel was beginning to become weathered in isolated locations. A full internal inspection was performed as the bullet was just recently moved to this site prior to the inspection and had been out of service for two years. Some general items noted were that the installation of the PSV and the piping had yet to be put in place at the time of inspection. No instrumentation had been installed on the vessel as it was not in service at the time of inspection.

Note: No vibration was noted as there was no rotational equipment in the vicinity of the vessel.

Recommendations

1. The bullet was in generally good condition with some minor insulation damage (not much chance for any Under Insuation Corrosion at this point - UIC).

2. Once the piping and PSVs are installed, the vessel should be verified prior to entering into service. As a minimum the PSV service reports need to be reviewed and these reports updated accordingly.

3. The next API 510 External Inspection should performed in 5 years time, 2015.

4. The next PSV service should be in 5 years time, 2015.

5. The next API 510 Out-of-Service (Internal) Inspection should be performed in 10 years time, 2020 (at the same time as the external inspection).

6. The bullet is fit for service.

7. The MPI was acceptable - see attached report.

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Inspector: Chris McGrath-Hardy

Reviewed By: Terry Williams