14th International Research/Expert Conference
"Trends in the Development of Machinery and Associated Technology"
TMT 2010, Mediterranean Cruise, 11-18 September 2010

PIGGING SYSTEM

Mr.sc. Halima Hadžiahmetović
Prof.dr. sc. Ejub Džaferović
University of Sarajevo
Faculty of Mechanical Engineering in Sarajevo
Vilsonovo šetalište 9, 71000 Sarajevo
Bosnia and Herzegovina

ABSTRACT
Hydraulic transport and disposal of fly ash in the ratio fly ash:water-1:15, which is applied over 20 years, confirmed the negative impact that the quality of air, and on the quality of surface and underground water. Mentioned environmental problems and disadvantages of the available water is the reason for the implementation of reconstruction of the existing system. New technology based on dense slurry in the ratio (fly ash:water- 1:1). The basic characteristics of this technology is that the water mixes with fly ash and bottom ash in the ratio 1:1 and in the form of dense slurry transporting by high pressure pumps and by pipeline to disposal area. Pigging in the maintenance of pipelines refers to the practice of using pipeline inspection gauges or 'pigs' to perform various operations on a pipeline without stopping the flow of the product in the pipeline. The pipeline is normally segmented into sections, and a pig trap is fitted at the start and end of each section. The pig trap is similar to an air lock or a torpedo launch tube. It is isolated from the pipeline by a valve, so it can be depressurized to load the pig. Once loaded, the trap door is closed and the trap is pressurized. With the main trap valve open, oil or gas flow can be directed behind the pig to push it into the pipeline. The reverse process applies at the other end of the line, when the pig is received. Normally pigs travel through a pipeline at a walking to a running pace (0.5 to 4 m/s, 1 to 12 ft/s, or 0.7 to 8 mph).
Keywords: Hydraulic transport, pigging, pipeline, launching part, retrieval part

1. INTRODUCTION

Long experience at existing disposal area with hydraulic transport and fly ash disposal pointed on the environment pollution by spreading fly ash particles with wind. Present used transport and disposal of fly ash and water in ratio of 1:15 creates a large amount of water, which goes undergroung and mixed with underground waters, and pollute them. Mentioned environmental problems and disadvantages of the available water is the reason for the implementation of reconstruction of the existing system. New technology based on dense slurry in the ratio (fly ash:water- 1:1). The basic characteristics of this technology is that the water mixes with fly ash and bottom ash in the ratio 1:1 and in the form of dense slurry transporting by high pressure pumps and by pipeline to disposal area [1].
A pigging system will be used to maintain and to avoid the scale inside the long distance slurry pipeline. This system is built up from two parts [2]:

- 1st part (launching part) is located at the valve station directly before the dual valve
- 2nd part (retrieval part) is located at the and of the long distance steel slurry pipeline

2. LAUNCHING STATION (1ST PART)

Directly before the dual valve the slurry pipeline is equipped with a blind flange. The pig launcher can be put here after removal of this blind flange [3]. The launcher is divided in two parts; the size of the

lover part is exactly the same as the slurry pipeline and the 2nd part is one size of nominal diameter more (figure 1.). This bigger diameter is required since different size and different density of pigs will be (or can be) used during pigging procedure. The top of the launcher is closed with blind flange which is equipped with a 1 ½" bal manual operated valve (figure 2.).
The pigging procedure is as follows:

- removing of blind flange from the slurry pipeline before the dual valve
- assembly the pig launcher
- remove the blind flange from the top of the launcher
- put the pig into the launcher
- close back this blind flange
- open the ball valve (for few seconds) to let the pressurized air to push the pig into the slurry pipeline
- close the ball valve
- after that the washing (now pigging) procedure of the long distance slurry pipeline can be started

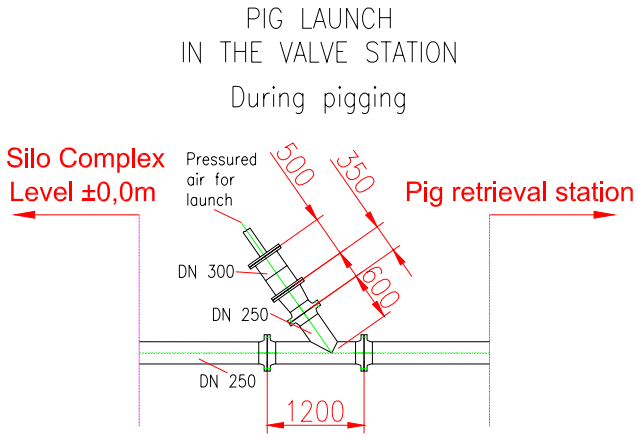

Figure 1. Pig launch in the valve station [1]

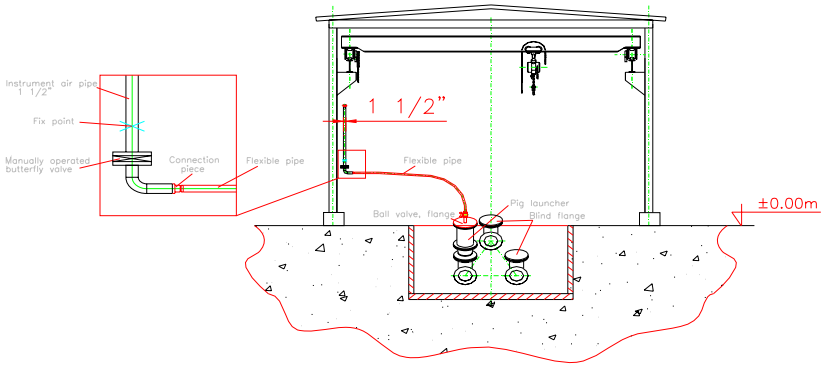

Figure 2. Pig launch [1]

The following figure 3. shows the method of pigging:

Figure 3. Method of pigging

After approx. 30 minutes (this time can be calculated from the water flow and from the length of the pipeline has to be pigged) the pig will be at the end of the steel slurry pipe and will be cached at the retrieval station as shown on the figure 4.

3. RETRIEVAL PART (2ND PART)

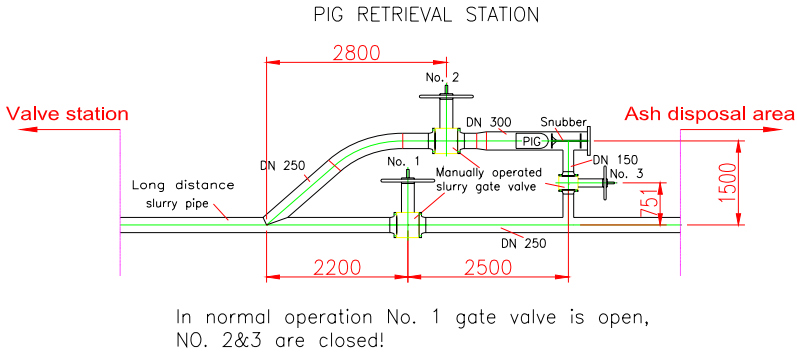

Figure 4. Pig retrieval station [4]

That means during pigging procedure the valve No1. is closed while the valves No2. & No3. are open. If the pig has passed through the pipeline the snubber stops it. In that case the pressure will increase after the 4th stage slurry pipe, and can be checked since there is a pressure transmitter in the pipeline at the valve station [4]. The operator should stop the system and than the blind flange can be opened from the pig retrieval and the pig can be removed from the pipeline.If it is necessary the procedure can repeat again (or more times) [5]. For the retrieval station there are more options, see the following figures 5, 6 & 7:

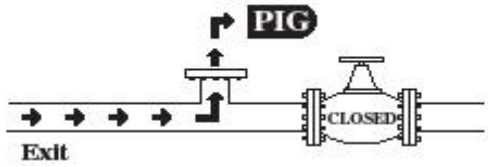

Figure 5. Retrieval "Tee"

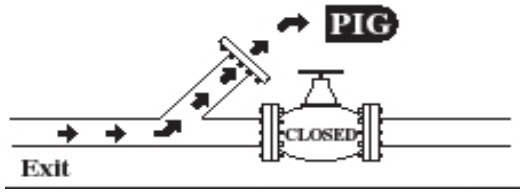

Figure 6. Retrieval "Wye"

Figure 7. Retrieval "Oversized Spool Piece"

After the pigging procedure has finished (figure 8.)

- manually operated valve has to be closed on the instrumental air pipe
- the flange with ball valve and the connected flexible pipe has to be removed from the launcher
- the launcher has to be removed from branch built in pipeline before dual valve
- close branch with blind flange

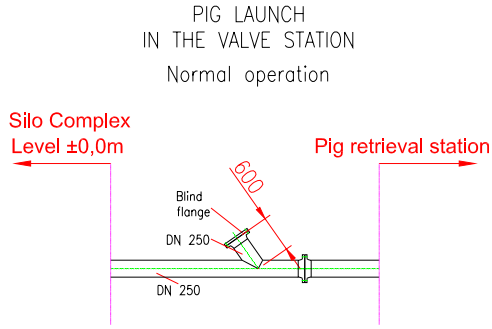

Figure 8. Pig launch in the valve station (normal operation) [5]

4. CONCLUSION

- Fast, safe and economical restoration of flow and pressure within pipelines and tubular systems by the use of versatile Poly foam pigs to remove unwanted "build-ups" causing restriction of the pipe's internal diameter.
- Excavations kept to minimum, poly foam pigs can clean long distances in a single run, without the need for numerous cut-ins that other cleaning systems require. Poly foam pigs can clean lines, traveling at speeds up to 3 meter per second.
- Clear compressed air propels the poly foam pig through the line, salvaging product as it travels. Poly foam pig is then recovered from receiver / catcher.
- With certain products it is not necessary to empty the line before running the next product. This can be achieved by means of batching.

5. REFERENCES

[1] Halima Hadžiahmetović (2008.), Optimizacija hidrauličkog transporta pepela i šljake u obliku guste hidromješavine/ magistarski rad, Faculty for Mechanical Engineering Sarajevo
[2] Dinko Knežević et al., Hidraulički transport mineralnih sirovina, Rudarsko-geološki fakultet, Beograd 1996
[3] Šašić Mane, Proračun transporta fluida i čvrstih materijala cevima, Naučna knjiga, Beograd, 1990
[4] Halima Hadžiahmetović, Štefanija Klarić, Ivica Kladarić (2009.), Opis magistralnog cjevovoda hidromješavine pepela i šljake , 7. Skup o prirodnom plinu, toplini i vodi, Osijek 21-24.10.2009.
[5] Halima Hadžiahmetović, Ivica Kladarić, Štefanija Klarić, Raza Sunuhahpašić (2009.), Tehnologija zavarivanja i kontrole kvalitete zavarivačkih radova magistralnih cjevovoda, 5. Međunarodno znanstveno-stručno savjetovanje, Robotizacija i automatizacija u zavarivanju i ostalim tehnikama, Slavonski Brod 11.-13.11.2009.godina