



## **AUTOMATIC MULTIPLE PIG LAUNCHING SYSTEMS**

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### Abstract

This paper describes the background to Multiple Pig Launching Systems, how they work, their applications & their advantages/disadvantages. It also covers Pipeline Engineering's new and innovative system involving specially developed technology (patent applied for Application No. 0603369.0), to allow the individual launching of preloaded pigs from the majority of standard launching traps with no launcher modifications.

### Introduction

All pipelines need to be pigged at some time in their operational lives, whether this is as part of a regular frequent cleaning pig programme, as a precursor for an inspection tool or maintenance task, or for pipeline conversion to allow it to carry a different product. However the main requirement is for effective cleaning and water removal as part of a regular pigging programme to prevent throughput loss, or corrosion problems. These regular pigging runs can require additional trained manpower with expertise in pigging operations that add additional costs to the installations already high operating costs.

This therefore is one of the many reasons regular pigging, or in fact any pigging at all is avoided on a number of pipelines around the world. Figures such as 10-20% of all pipelines that require pigging are actually pigged on a regular basis have been quoted.

The use of multiple pig launchers, where a number of pigs or spheres are pre-loaded into a launcher and launched as and when required, overcomes a lot of the HS&E and additional manpower requirements as the launchers are opened much more infrequently. This reduces the frequency of time consuming cordoning off of the area, venting and draining down of the launcher, and monitoring of the launcher and pipeline conditions. However the initial cost of these systems can be prohibitive. This is especially true if the benefits of regular pigging, and the hazards and potential costs of not pigging a line are unknown, or not even fully understood by the operator.

These multiple launchers are used in many areas around the world; however they are of specific use in the following areas:

- Remote land based locations, such as desert pigging stations.
- Unmanned platforms that are visited routinely for pigging and maintenance purposes.
- Subsea launchers for commissioning and tie-ins.
- Standard pipelines that require frequent pigging.

## Current Multiple Pig Launching Systems

So what is currently available?

There are three main systems used globally, namely:

1. Valve type Pig Launcher
2. Vertical Multiple Pig Launcher
3. Automatic Sphere Launcher

### 1. Valve Type Multiple Pig Launcher (See Figure 1)

The trap is fitted with a set of launch valves for each pig in the launcher. This allows line pressure to be directed behind each pig in turn and so be launched individually as required. Although a very reliable system, the additional valving requirement adds considerable cost to the system, especially when fitted to a large diameter pipeline, due to the high cost of the large valves required for the multiple kicker lines.

This system is used predominantly in sub-sea applications with either a diver or ROV operating the valves as required, or the valves are fitted with remotely operated actuators which adds again to the overall cost. It is also retrospectively fitted to existing installation pig launchers if an automatic launching requirement is later identified.

### 2. Vertical Multiple Pig Launcher (See Figure 2)

This system is based around the space saving solution of a vertical pig launcher as used on many offshore installations. It is to all intents and purposes an extended standard launcher, but with the addition of hydraulically operated launch pins that protrude into the oversize barrel of the launcher. The first pig is loaded into the throat of the launcher, and then the first or lowest launch pin is extended. Another pig is then loaded resting on, and held up by the launch pin. Subsequent pins and pigs are then inserted until the traps capacity is reached.

The first pig is launched in the normal way. When another pigging run is required, the lowest launch pin is retracted, and the pig above it falls into the throat of the launcher. This pig is then launched. Subsequent pins are then retracted as and when further pigging runs are required.

As before this is a very reliable multiple pig launching system, however it does suffer from the same problems in that the initial outlay can be quite high due to the launch pins and the hydraulics required to operate them. Extra maintenance is also required to ensure the launch pins operate correctly, and they require regular inspections to ensure that they have not become bent due to excessive forces.

### 3. Automatic Sphere Launcher (See Figure 3)

Although not technically a pig launcher, spheres are regularly used when large numbers of cleaning runs are required, but the efficiency is not critical, usually where the removal of unwanted fluids is the primary cleaning requirement.

They operate in a similar manner to the Vertical Multiple Pig Launchers already discussed, utilising launch pins, but with the trap on a slight decline from the horizontal. Spheres are loaded with the front pin extended, and the rear pin retracted. When a launch is required the rear pin extends, holding back the remaining spheres. The front pin retracts allowing the lead sphere to roll into the

pipeline. When the downstream signaller indicates the sphere has been successfully launched, the front pin extends, the rear pin retracts, the remaining spheres roll forward and the system resets itself for the next launch.

Although quite widely used, this system is predominantly used for fluid removal and not for physical line cleaning due to the sphere only having one sealing face, and therefore a tendency to ride over solid residues in the pipe.

### Pipeline Engineering's Solution

#### The Automatic Multiple Pig Launching System (AMPL)

Pipeline Engineering identified a need for a multiple pig launching system that can be retrospectively fitted to existing launcher facilities without the need for costly trap modifications. To solve the problem it was decided to concentrate on the design of the pigs themselves, and to develop a method of controlling the launch using bolt-on control technology (patent applied for Application No. 0603369.0) and standard pigs instead of adapting the trap.

The system operates in a similar way to standard pigging equipment. The Pigs are either pre-loaded into a specially designed cassette, which is then inserted into the standard trap, or they are loaded into the trap in which the cassette has already been fitted. The number of pigs in the cassette is pre-determined by the length of the trap.

The launch control system on the pigs is designed in such a way that the next pig to be launched is only armed when the trap has been depressurised after the previous launch, and so cannot be launched accidentally. It has the additional safety system in place that if the control mechanism fails, no pigs can or will launch. If a pig does fail to launch, the system has a 2<sup>nd</sup> chance to launch simply by depressurising and then re-pressurising the launcher. In the highly unlikely event that the pig fails to launch during this 2<sup>nd</sup> attempt, then the pig will be required to be unloaded and investigated.

The advantages that the Pipeline Engineering Automatic Multiple Pig Launching System has are the same as the benefits previously discussed. It also has one important unique benefit, it can be retrospectively fitted to almost all currently in use pig launchers, with no adaptation to the current configuration or the addition of any extra valving or control systems. The only addition is the specially designed launcher basket which can be removed easily if Intelligent or any other non-routine pigging is required.

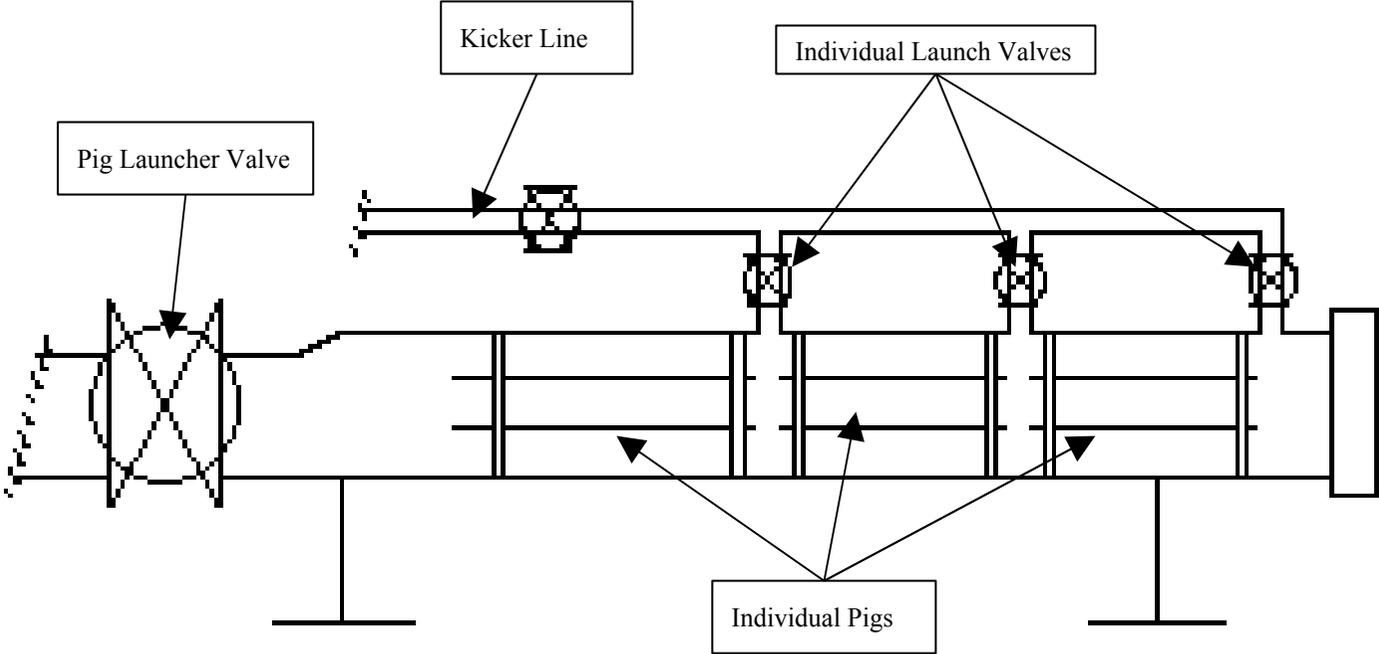
### Conclusions

The need for frequent regular pigging of all types of pipelines has been graphically highlighted recently with some high profile oil spillages. These can be linked to sediment build up causing internal corrosion and hence pipeline leaks. The spills could have been avoided with the application of a specifically designed pigging program and the correct pigs to carry it out.

Automatic Multiple Pig Launchers are an exceptionally good way of carrying out general cleaning pigging programmes, reducing the number of deployments of pigging specialists, and allowing installation staff more time to concentrate on other routine requirements.

The system that is selected however must be tailored to both the installations and the pipelines specific needs, and also be flexible enough to adapt to changes in those needs if and when they are required.

Figure 1. Valve Type Multiple Pig Launcher



**Figure 2. Vertical Multiple Pig Launcher**

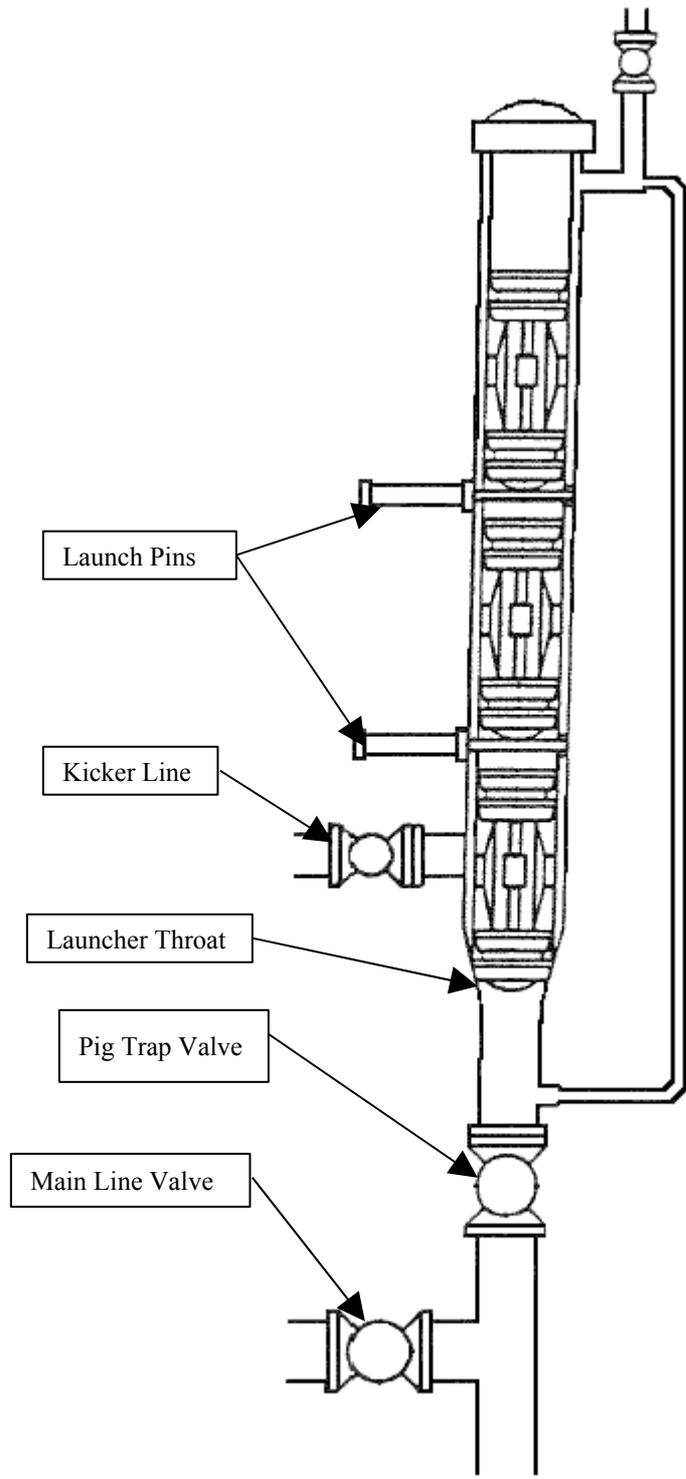
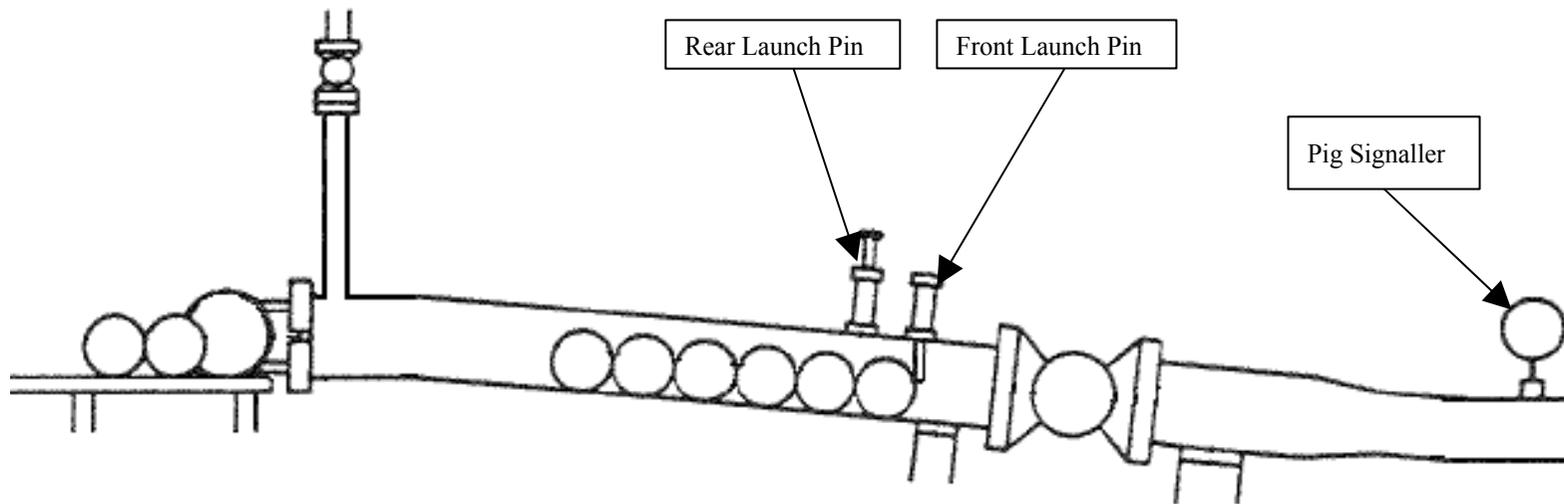


Figure 3. Automatic Sphere Launcher



## References

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