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Foreword

THE Pigging Products & Services Association was formed in 1990 with the following stated aims:

To promote the knowledge and practice of pipeline pigging, and to ensure that the Members are aware of the needs of the markets for the related products and services, by providing a channel of communication between the Members themselves and the users and other interested parties.

In pursuit of these aims, PPSA has since replied to literally thousands of requests for information, and now distributes its annual *Buyers Guide and Directory of Members* to over 2000 named individuals throughout the pipeline industry, world-wide.

One of the most common requests has been for information concerning pigging generally. This enables even those pipeline operators who already use pigs or pigging services to get a better idea of how they might use them more effectively, or how they might be able to use them for different purposes. It is hoped that this book, *An Introduction to Pipeline Pigging*, will meet this need. It is anticipated that it will be updated periodically, and PPSA would welcome any comments or suggestions as to how it might be improved in subsequent editions.

Finally, on behalf of its Members, PPSA would like to thank you for your interest in its activities and remind you that it has been created to help with any aspect of pipeline pigging, so do not hesitate to contact us if the need arises.

What is a ‘pig’?

PIGS ARE devices which are inserted into, and travel throughout the length of a pipeline, driven by the product flow. They fall into two categories: ‘utility’ pigs - which perform a function such as cleaning, separating or dewatering the pipeline, and in-line inspection, or more simply, ‘ILI tools’ (sometimes referred to as ‘intelligent pigs’ or ‘smart pigs’) - which provide information on the condition of the line as well as the extent and location of any problems.

The history of pipeline pigging

The Pigging Products & Services Association is indebted to J. Frank Gray of Pipeline Dehydrators, Inc., for providing the following brief history of pipeline pigging.

THE HISTORY of pipeline pigging is interesting and probably lacking in full truth; however, the following is usually accepted as an answer to many questions about the history of pipeline pigs.

The first pigging operation took place around the year of 1870, a few years after Colonel Drake discovered oil in Titusville, Pennsylvania. Before pipelines were used for transporting it, the oil was trucked to the refinery by horse-drawn tank wagons. This proved to be very difficult during winter months because of heavy snows and frozen wagon tracks, and in wet weather when wagons would sink in the mud. To improve upon this method of transportation, a pipeline was constructed, the material of which is not recorded, but each length of pipe was almost certainly joined by the bell-and-spigot method that we see today in plastic pipe. After transporting crude oil for a year or two through this pipeline, the flows began to decrease, and the pumping pressure increased, indicating that there were deposits building up on the inside walls of the pipe. Many things were tried to remove the paraffin deposits, but nothing worked effectively for any period of time. Eventually the idea of pumping something through the pipeline was considered. It has been suggested that a bundle of rags tied in a ball was used, and with positive results. Later, bundles of leather were used in place of the rags. Leather will swell when wet, so it created a tight seal going through the pipeline.

Another story concerning the history of pipeline pigging takes place around 1904, when a 4-in steel gas line was installed in Montana. During the construction, there was a rock slide which covered the line, and it was not known whether there was a buckle or a flat spot, so a rubber ball was made to pump through the pipeline to find out. Upon exiting, it was determined that if there was any damage to the pipe, it was not sufficient to restrict the flow. It was also discovered that a lot of debris was left in the pipeline such as rocks, dirt, sand, tools, etc. Rubber balls (spheres) have been used ever since as displacement pigs and for meter proving.

The question most people ask is “How did a pig get its name?” One story goes that two pipeliners were told to go out to the pipeline and listen for the pipe cleaner to go by. This pipe cleaner consisted of a steel pipe or mandrel body with flanges welded on both ends. Discs made of leather sheets were stacked together to provide thickness, and attached to the flanges. As the pipe cleaner travelled down the line pushing out debris, it made a squealing, scraping, noise. As the cleaner went by, one pipeliner made a comment to the other about “hearing that pig squeal”. These stories are generally accepted as possibly being true.

Whether they are true or not, they at least indicate that pigs have been around for a long time. For more than half of a century pigs consisted of steel bodies and rubber, leather, or urethane cups or discs. They were equipped with wire brushes, scrapers, knife blades, and other devices for ploughing. Until 1960, most pipe cleaning was limited to the oil and gas industry. Then the foam bullet-shaped pig was developed; it was referred to as the *Polly Pig* because it was made of polyurethane foam. Although the oil and gas industry remains the largest user of the foam pig, many new industries such as municipal water and sewer, processing industries, petrochemical, mining, and other industries are now using pigs in their pipelines, realizing gains such as energy savings, increased flows, decreased pumping pressures, cleaner product, and salvaged product.

The lessons learned from standard pigging operations to clean, dewater, fill, and displace product from pipelines, and the pressures, speeds, and problems incurred, have contributed greatly to the development of instrumented pigs. These were introduced in the late 1960s, and development is continuing to the present day.

The development and improvement of all types of pipeline pigs has been a continuing process, and this trend is set to continue. There are now literally hundreds of different types, some with specific or limited use and others which are standard products. Apart from the main functions of sweeping, drying, wiping, cleaning, scraping, inspection, and integrity monitoring, ‘semi-intelligent’ pigs now perform additional functions such as alerting and initiating actions involving pumps and valves, and making an input in computerized operations, sometimes by through pipe-wall communications.

There is no doubt that the pigging industry will continue to make full use of new technology as it emerges, in order to meet the challenges of tomorrow.

Acknowledgements

THE PIGGING Products & Services Association would like to acknowledge the help it has received from its Members and others in producing this booklet. Special thanks are due to the Gas Research Institute (GRI) in the United States for permission to reproduce sections from the Appendices to the Topical Reports: GRI 91/0365: *In-line inspection of natural gas pipelines*, and GRI 91/0367: *Magnetic flux leakage technology for natural gas pipeline inspection*. Special thanks are also due to On-Stream Systems Ltd., and Hershel Vanzant, for permission to reproduce sections from their pigging manual entitled *All about pigging*.

Important notice

THE PURPOSE of this publication is to inform the reader of general pigging practices in modern pipeline operations. ***It is not intended to be an instructional manual, but rather a general guide to pigs and pigging practices.*** In general, the practices outlined in this book will be applicable up to a point; but in the final analysis, specific programmes will have to be tailored to meet the specific purpose, the line conditions, and company operating policies and procedures.

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