Improved and verifiable method for cleaning pipes

DynaClean® - verifiable pipe flushing

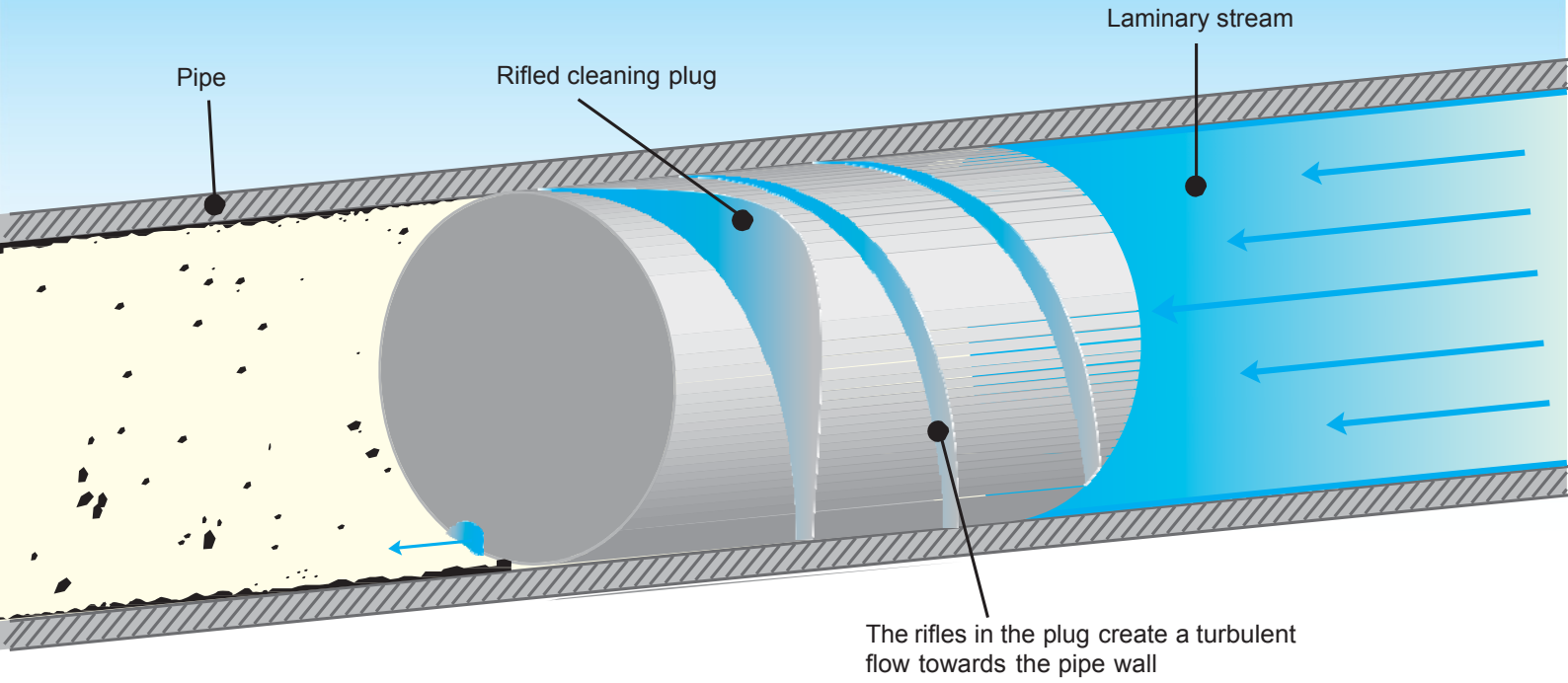
- Increased cleaning efficiency
- Verifiable results to cleanliness standards
- Dramatically reduced flushing time
- Reduced labour needs and costs
- No need for large and costly equipment
- Uses small amounts of flushing fluid
- Low energy use
- HSE - improved operator safety
- Flushing and surface protection in one operation - applicable in oil filled systems
- Cleans single pipes and assembled systems
- Off-the-shelf hardware for part accessibility
- Biocide coated plugs for microbial treatment
- Environmentally friendly, no chemicals needed

DynaClean® flushing system overview

The DynaClean® system is a revolutionary new concept for cleaning the interior surface of pipes. A specially designed, soft foam plug with an unique rifling pattern guides the flushing fluid around the plug surface at high speed and flow rate, as the plug moves along the pipe. This creates a turbulent flow against the pipe wall ensuring effective cleaning, and successfully eliminating the sublaminar layer, a common issue with hot oil flushing. The system requires no large-scale equipment, as the pressure and flow needed are much lower than for conven- tional high-pressure flushing. After cleaning, an oil sample is drawn and analyzed for particle content and moisture, for documented cleanliness levels. As the plug is semi-soft, it can be launched in assembled and complex systems or be an integrated part in pipe production and assembly.

ONSfTE: *The DynaCiean•system in operation at Norwegian Shipyard Utilizing an in situ traver.se crane, the DynaCiean•*systEm *can be operated on a relatively small footprint. A standard containe1; a workbench, a standard receiving tank, and storage for plugs* is *all that* is *required For spare part availability we have attempted to use* as *many off-the-shelf parts* as *possible, and use standardized clamps and parts for the launching chamber and connecting units. For our oil supply we prefer to use standard 1000 liter tanks. New plugs can be seen stored on the container roof*

- Better cleaning
- Cleans mounted pipe systems
- Saves time
- Cost effective
- Saves labour
- Verifiable results



Verifiable cleanliness

The DynaClean® method provides the only alternative for documented system cleanliness. Drawing an oil sample from the slip stream after the last cleaning plug, the sample is then analyzed and the NAS class of the pipe can be documented. We can supply a DynaView® analysis unit for quick oil sample quality control.

DynaClean® and competing methods

The most commonly used of the competing methods for cleaning pipes are acid cleaning, high pressure water rinsing, hot oil flushing and chain dragging. They all have clear drawbacks. In developing the DynaClean® system, we have sought to address some of these issues and create an overall bettered method of cleaning pipes.

Pipe sizes

The pipe size to be flushed is only restricted by the amount of oil/air needed to propel the plugs and the size of the available receiving tank. We are currently operating standard DN-sized pipes up to DN450 at lenghts up to 6 meters using oil from a 1000 liter oil tank as propellant. In other applications we have flushed pipes up to 60m at DN65 using oil, and a 40m pipe at DN200 using at 3bar high pressure air system, both with very successful results.

ANALYSIS: Samples are secured and analyzed by advanced particle counting methods. This is the basis for the verification and cleanliness certification of the process. The picture shows an automatic microscope counting the particle levels in an oil sample.

Plugs

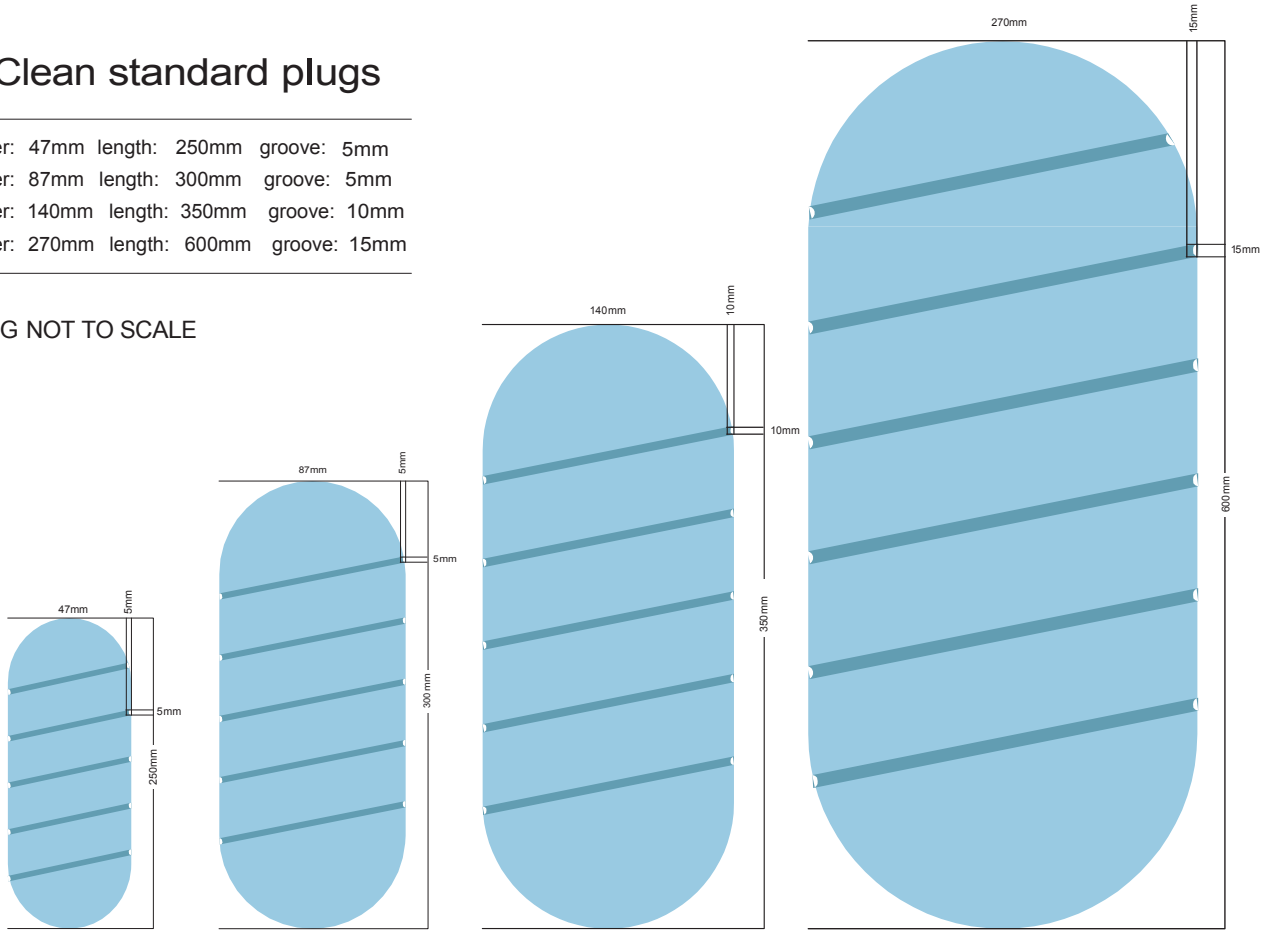
A series of standardised plugs are adapted to a host of DN and ANSI sizes, from the smallest DN65 plug ranging up to the large DN450. The plugs are made from a semi-soft spongy foam material that absorbs oil, allowing them to adapt to difficult bends and different pipe sizes and shapes. If your application requirements are outside our current range, we are able to develop other plug sizes.

In the development of the plugs, we were challenged to flush a very difficult pipe routing, and throughout our extensive testing the plugs found their way to the receiving tank every time, guided by the pressure built up by a host of blanking plates. We reuse the plugs for the first two rounds of flushing and always follow up with a clean plug for the final run.

DynaClean standard plugs

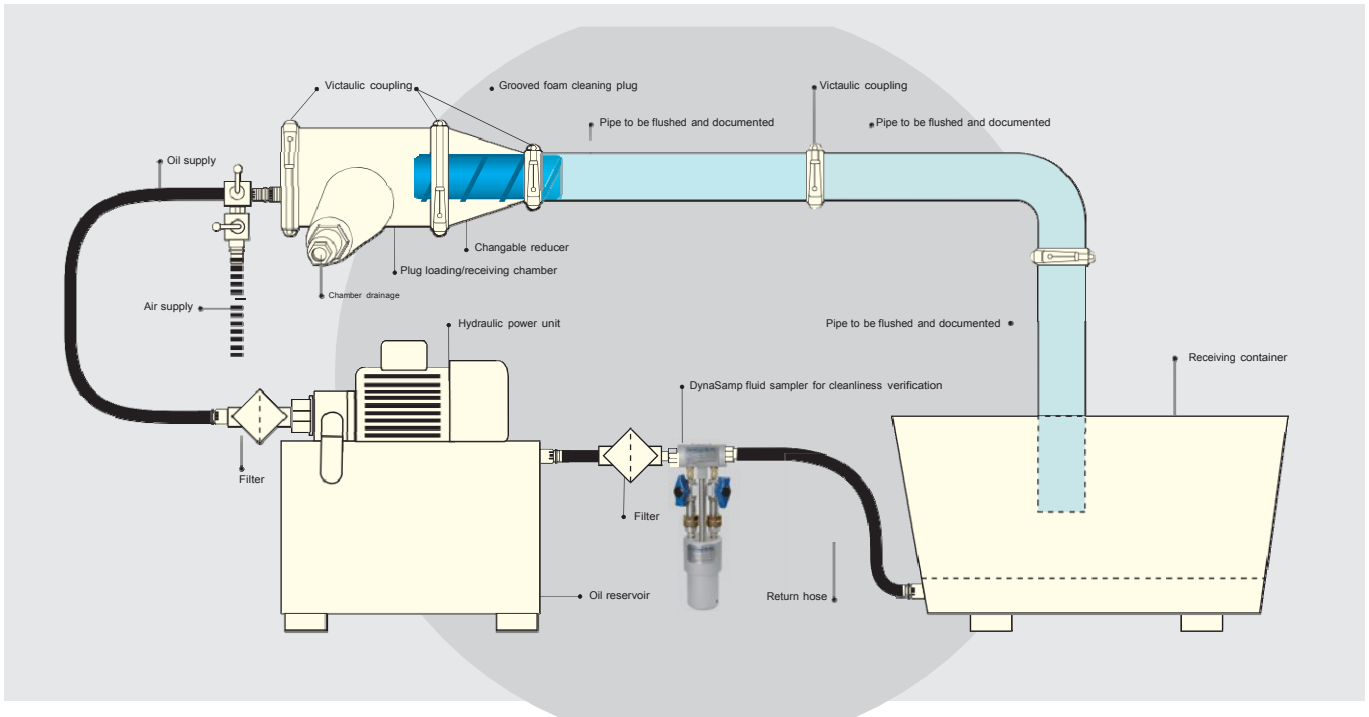
1. Diameter: 47mm length: 250mm groove: 5mm
2. Diameter: 87mm length: 300mm groove: 5mm
3. Diameter: 140mm length: 350mm groove: 10mm
4. Diameter: 270mm length: 600mm groove: 15mm

DRAWING NOT TO SCALE



ABOVE: These are the standard existing plug sizes. The foam material they consist of is flexible enough to provide great adaptability between standard sizes. Production runs of other sizes can be custom made to order if needed.

BELOW: The DynaClean® principle, showing a setup consisting of three connected pipes being flushed simultaneously. A standard container is used as a receiving tank for the plugs and oil. The oil is then run through a filtration process before it is used again for flushing. The inline DynaSamp® unit makes it possible to keep the cleanliness of the flushing oil under surveillance. High pressure air can be used as an additional propellant.



FRAS technology

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