Problem

Worldwide thousands of miles of pipelines in the range of diameters one to three or more meters are existing. The outside surface normally is protected by various kinds of coatings. If the pipe is underground, lifetime protection is necessary. Pipes in the open air might require maintenance, depending, between years or decades. The inside surface, depending on the medium flowing, quite often needs a coating; and e.g. in hydroelectric power station systems, such coatings must be rebuilt after 20 to 40 years of operation. Blast cleaning normally is the only answer to start with. Whereas outside cleaning can be performed without affecting operation of the pipe system, all inside work will create a complete out of work period. Such interruptions can become very costly and therefore maintenance work must be done in the shortest time possible. Blast cleaning is common, depending on diameter of pipe. Below one meter, an automatically operating, rotating device with two and more air-operated blast nozzles can be used. Above, a manual air-operated blast cleaning procedure may be practicable. But for high productivity, the only solution is the use of wheel-operated abrasive cleaning. Following is the description of such a device.

Design Principle of an Interior Wheelblast Device

There are many design configurations necessary depending on the two major criteria:
1. The inclination of the pipeline. It can be horizontal to vertical in a more or less straight line (e.g. hydroelectric power station systems), or it can go up and down (e.g. water supply systems).
2. The diameter of the pipeline. For the herewith described design technique, a minimal internal diameter of one meter seems to be the absolute limit, 1.2 meters and more is recommended. Exceeding 4 meters, an concept on another principle is more likely.

Figure 1 shows the main components of such an installation. The blast module performs the actual blasting with the wheel equipment, the media recovery and separation and the drive gear. The vacuum module generates the necessary pressure to operate the media recovery. It also carries the compressor to perform the periodical filter-cartridge cleaning. This unit is coupled to the blast module. The third package, the silo module, is functioning as a filter unit with storage capacity. This unit is mobile, that means, if the maximum level of waste is reached, all blasting will be interrupted and the silo unit maneuvered to the end of the pipe or a point where the contents...
can be discharged by gravity, or if designed for, by vacuum. To control the complete device, the example shows a combined control/power box which is installed outside the pipe. Necessary in between is at least a heavy power line rating e.g. 40 Amps at 400 VAC. Additionally, depending on communication principle, e.g. a 50 wire control cable. Of course, some more equipment is necessary all depending on the actual situation of the pipe system. If the inclination reaches a certain amount, the equipment will be supplemented with elevator devices mainly in respect of safety.

Fig. 2 shows the blast module. The wheel equipment, normally with two motors, itself is rotating reciprocating nearly a full circle, the orthogonal movement is performed by the self-propelled blast module itself. All speeds and feed limits are optimized and work automatically, but can be also manually operated with the aid of the camera system.

**Operation**

Same as modern mining machinery or heading and cutting machines for tunnels, the machine must carefully be designed and/or adopted to the job provided. So there is hardly a general purpose machine possible. The following description matches with a 1 meter pressure, 350 meters long, 25 to 35 degrees inclination. Open-ended 2 meters free at valley station. Suggested starting point: Valley station.

- Install hoisting and safety equipment at mountain station. Install blast module at valley station. If possible provide rails to enable machine to start right from beginning of pipe. Connect combined vacuum/silo-module by intermediate suction pipe, e.g. 30 meters in length to blast module. Make electrical and all other outfit ready.
- Start blasting. Stop when silo needs discharging. Stop and retract blasting module if blast media is exhausted. Refill and return, continue.
- If length of intermediate suction pipe limits further penetration of blast module, stop and retract blast module. Attach now vacuum module and silo module, move unit to point where job has ended.
- Work until silo needs discharging, stop process, disconnect silo remote control and bring it back to discharge station. When empty, move it back to blast module and continue with job.

**Conclusion**

The above mentioned principle of such a pipeline automatic internal wheelblast equipment can be a time and cost saving tool in many cases. But each application must be studied carefully to find the best solution and to make sure that such an expensive high-tech device will become successful. ☀️

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*Fig. 2. Blast Module of RIV-1000 Pipeline Internal Blasting Device*