

Submitted for recognition as an American National Standard

FLUID POWER PIPING CLEANING PROCESS

Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

1. Scope

1.1 The procedures and guidelines detailed in this SAE Information Report provide various techniques and processes to properly clean fluid power piping prior to assembly and operation.

1.1.1 There are two recommended processes, pickling and flushing. Each procedure will remove particulate contaminants if properly applied.

1.2 Field of Application

1.2.1 The process of conductor cleaning is applicable to hydraulic, lubrication, and pneumatic fluid power systems.

1.2.2 The conductor fabrication process of welding, brazing, heating, machining, and washing of tubing and pipes, causes contaminants to collect on the inside diameter of the conductor.

1.2.3 If these contaminants are not properly removed and anticorrosive measures taken, permanent conductor damage may result.

1.2.4 Conductor cleaning and inspection must be done prior to system installation and assembly to remove any contaminants.

1.2.5 Proper conductor cleaning after assembly also assures that the system contamination level meets or exceeds acceptable operating parameters prior to system start up.

1.2.6 Hydraulic and lubrication systems require a cleanliness level which should meet cleanliness levels established by ANSI/(NFPA/JIC)T2.24.1.

1.2.7 This document should parallel O.E.M. and manufacturer procedures and standards to remove conductor associated contaminants prior to equipment assembly.

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2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 ANSI PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI/(NFPA/JIC) T.2.24.1—Hydraulic Fluid Power—Systems standard for stationary industrial machinery

2.1.2 ASTM PUBLICATION—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 4174—Standard Practice for Cleaning, Flushing, and Purification of Petroleum Fluid Hydraulic Systems

2.1.3 ISO PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO 4406—Hydraulic fluid power—Fluids—Method for coding level of contamination by solid particles

2.2 Other Publications

Parker Hannifin Corporation - Tube Fittings Division
The Rexroth Corporation - Industrial Hydraulics Division
Vickers Incorporated

3. Definitions

3.1 Fluid power piping consists primarily of pipe, tubing, hoses, and fittings.

3.2 Pickling will remove any contamination from pipes or tubing, especially corrosion, scale, slag and weld spatter. The pickling process is typically an acidic solution which chemically "attacks" and loosens contaminate particles.

3.3 Flushing will remove dirt and other loose particle contaminants. The flushing solution does not chemically "attack" contaminant particles. The flushing process may not remove all contaminants. If contaminants are still present, the pickling process should be performed.

4. Pickling and Passivating

4.1 General

4.1.1 The pickling process should be used after any hot bending, brazing, silver soldering, or welding without anti-slag gas.

4.1.2 Passivating the piping after pickling protects the piping against rust for a limited time.

4.1.3 Stainless steel pipe also requires pickling after welding.

4.1.4 Black pipe may be purchased pre-pickled. The use of only pre-pickled pipe eliminates the possibility of inventory stock mix-up and may eliminate the need for future pickling depending upon the application.

4.1.5 The use of a professional pickling service is recommended.

4.1.6 Pickling process techniques vary, but two basic methods exist, bath and circulation pickling. Each pickling process involves several steps which need to be performed correctly.

- 4.1.7 Protective coatings or coarse contamination (i.e., steel chips, severe rust, etc.) should be removed prior to any machining or pickling process.
- 4.1.8 Protective coatings can be removed through the use of degreasing agents. The degreasing process may be classified as hot or cold. The processes vary due to the degreasing agents involved.
- 4.1.9 If degreasing is performed "in house" all manufacturer's safety precautions, practices, and procedures must be followed.
- 4.1.10 Removal of coarse contaminants and protective coatings can be accomplished by sand-blasting.
- 4.1.11 The sand-blasting process itself creates additional contamination within the piping. This additional contamination can normally be removed with a properly applied pickling process.
- 4.1.12 Care must be taken in long piping runs, especially those with bends and high spots where the pickling solution may not completely remove the contaminants.
- 4.1.13 Two bath type pickling processes are available, multi-bath and single-bath.
- 4.1.14 Multi-bath pickling involves several immersion steps, where as the single-bath process minimizes material handling.
- 4.1.15 The advantage to multi-bath over single-bath is time. Multi-bath pickling may require 2 to 3 h as compared to as many as 8 h to remove equivalent contamination levels in a single-bath application. Both methods satisfactorily remove particulate contaminants from piping and tubing.

4.2 Pickling Methods

4.2.1 MULTI-BATH PICKLING

- 4.2.1.1 Multi-bath pickling is the process normally used when there are large quantities of piping involved.
- 4.2.1.2 Pickling facilities will degrease the pipe or tubing and immerse the piping in an acid bath. This acid bath typically is a solution consisting of a 20 to 30% pure hydrochloric acid.
- 4.2.1.3 Depending on the contamination (i.e., weld slag etc.) the piping will typically remain in the solution for about 2 h.
- 4.2.1.4 The piping is then rinsed in a water bath to minimize transferal of the acidic solution into the neutralization phase.
- 4.2.1.5 To neutralize the acid, the piping is are placed in a bath of caustic soda and heated to about 70 °C.

4.2.2 SINGLE-BATH PICKLING

- 4.2.2.1 Single-bath pickling incorporates all the previously mentioned multi-bath steps into one process. This method of pickling is usually done for small scale applications.

4.2.3 CIRCULATION PICKLING

- 4.2.3.1 Circulation pickling is similar to a flushing process in that the pickling solution is circulated through the piping system. This process requires isolation of the piping and tubing from the other fluid power components.