Artisan's

ASYLUM
Hydraulic Assembly Basics

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Overview

• Setup
• Fitting Types
• Hose Sizing
• Assembly Techniques
Setup

• Assume everything will get coated in hydraulic oil. Everything.
  – Drop cloths on all tables and surfaces
  – Absorbent media available at all times
  – Cleaning station to degrease tools

• Wear gloves at all times, wash hands immediately after working with oil
Fitting Types
Fitting Types - JIC
Fitting Types - JIC

- Sealing surface:
  - 37 degree flare on nose of male fittings

- Tensioning mechanism:
  - Free-swiveling, floating hex nuts on straight threads

- Pros:
  - Easy to assemble
  - Widely available
  - New industry standard

- Cons
  - Easy to not tighten enough
## Fitting Types - NPT

### NPTR Thread Definition

![Diagram of NPTR thread definition](image)

1. **Taper of thread 1 in 16 measured as diameter.**
2. **Notch shows ANSI standard pipe thread gage.**

### Table: NPTR Thread Dimensions

<table>
<thead>
<tr>
<th>Nom. Pipe Size</th>
<th>O.D. of Pipe (in)</th>
<th>Threads/ in.</th>
<th>Height of Thread (in)</th>
<th>Pitch Diameter at End of External Thread (d)</th>
<th>Shortening of Thread (L2 - L6)</th>
<th>Length of Effective Thread, Max. (L4 - L6)</th>
<th>Total Length of External Thread, Max. (L2 - L6)</th>
<th>Incomplete Threads due to Character of Die, Max. (V)</th>
<th>Depth of Recess in Fitting (g)</th>
<th>Dia. of Recess in Fitting (h)</th>
<th>Distance Gage (g)</th>
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</table>

### Notes:
1. These dimensions agree with those developed by the Manufacturers' Standardization Society of the Valve and Fittings Industry. Thread lengths are specified to three decimal places for convenience.
Fitting Types - NPT

• Sealing surface:
  – Tapered screw with seal lubricant

• Tensioning mechanism:
  – Non-swiveling or swiveling tapered screw

• Pros:
  – ...

• Cons
  – Almost always leak
  – Difficult to assemble
  – Easy to screw up
Fitting Types - ORB
Fitting Types - ORB

• Sealing surface:
  – O-Ring touching down on machined surface

• Tensioning mechanism:
  – Straight non-swiveling thread

• Pros:
  – Easy to assemble
  – Widely available
  – Very robust

• Cons
  – O-Ring tearing if mishandled
Fitting Types - Flange Mount
Fitting Types - Flange Mount

• Sealing surface:
  – O-Ring touching down on machined surface

• Tensioning mechanism:
  – Bolt pattern

• Pros:
  – Easy to assemble
  – Widely available
  – Very robust

• Cons
  – O-Ring tearing if mishandled
Hose Sizing
Hose Sizing

• Hoses are sized by “Dash Number”

• Dash number is hose inner diameter in inches:
  – I.D. = Dash Number / 16
  – “Dash 8” = 0.5” I.D.
Hose Sizing

- Draw a line between desired flow rate and minimum or maximum flow velocities for your type of hydraulic path.
Hose Sizing

- Pressure to individual valve:
  - 6 GPM
  - Pressure line
  - Dash 5-6
Hose Sizing

- Return from individual valve:
  - 6 GPM
  - Return line
  - Dash 8
Hose Sizing

- Main pressure line to system:
  - 35 GPM
  - Pressure line
  - Dash 12-16
Hose Sizing

- Low pressure inlet to hydraulic pump:
  - 35 GPM
  - Suction line
  - Dash 24-30
Assembly Techniques
Basics

• Essentials:
  – Hydraulic oil acts like a grit/dust magnet
  – Grit/dust destroys hydraulic systems
  – All surfaces must be cleaned and oiled before assembly

• Set up in as clean an environment as possible

• Never leave hydraulic oil or cavities uncovered for any longer than necessary
Components

- All components must be filled with hydraulic oil before being attached to a system
  - Fill a small squeeze bottle with hydraulic fluid, use it to fill components as much as possible before assembly
- Consequence if not followed: pumps, cylinders, and valves die or misbehave
Bleeding

- Traditional hydraulic systems have some way of “bleeding” – removing air from hydraulic lines as much as possible
- Open circuit systems suffer less than closed circuit systems
- We have no effective way to do that right now; therefore, caution is called for
- Fill everything as much as possible
Fittings

- All fittings must be wetted
  - Threaded surfaces coated in hydraulic oil before assembly to lubricate tightening procedure
- NPT fittings must be coated in seal lube
  - ABSOLUTELY NO TEFLOM TAPE
  - No seal lube for any other type of fitting
- Fittings should be tightened as much as humanly possible