

FIBA Jumbo Tubes

Eugene Y. Ngai

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Chemically Speaking LLC

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High Pressure Jumbo Tubes

- Fabricated by 4-5 manufacturers
- US is made to DOT 3T or 3AAX Specification to 2,400 psig
- 3T is high tensile strength, lower weight
- 3T is susceptible to H₂ embrittlement
- Number of tubes based on total fill weight, e.g hydrogen chloride, 7 tube versus silane, 8 tubes

Tube Fabrication, FIBA

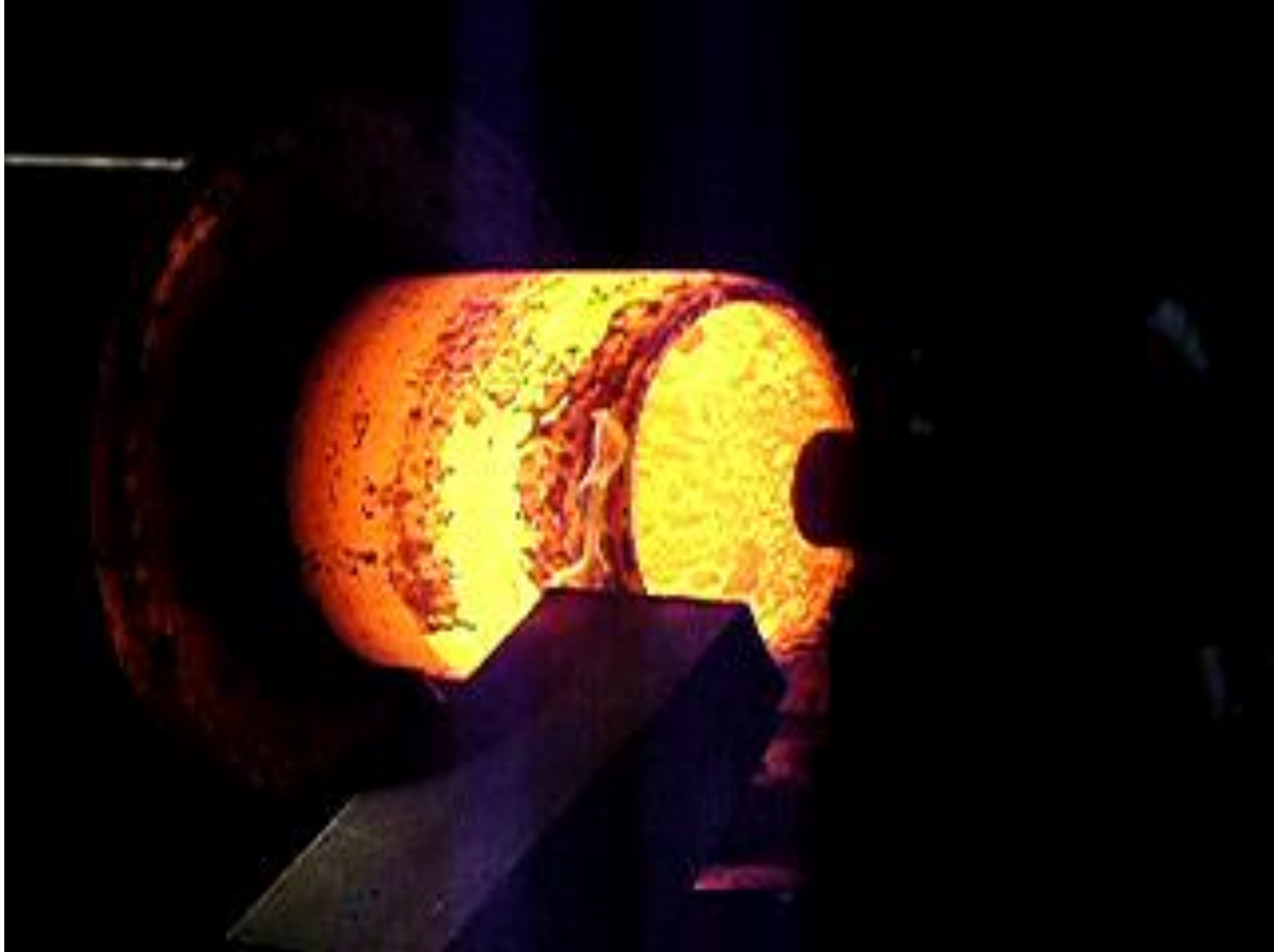
Large diameter seamless high pressure carbon steel tubes are cut into the desired length. The interior is then ground to the bare metal and a good finish using an abrasive wheel to remove all tube manufacturing slag, contaminants, etc.



Tube Fabrication, FIBA

- The ends of the tube are then preheated redhot
- As the tube is spun, a robot arm starts to neck the end of the tube to form a concave head with a neck



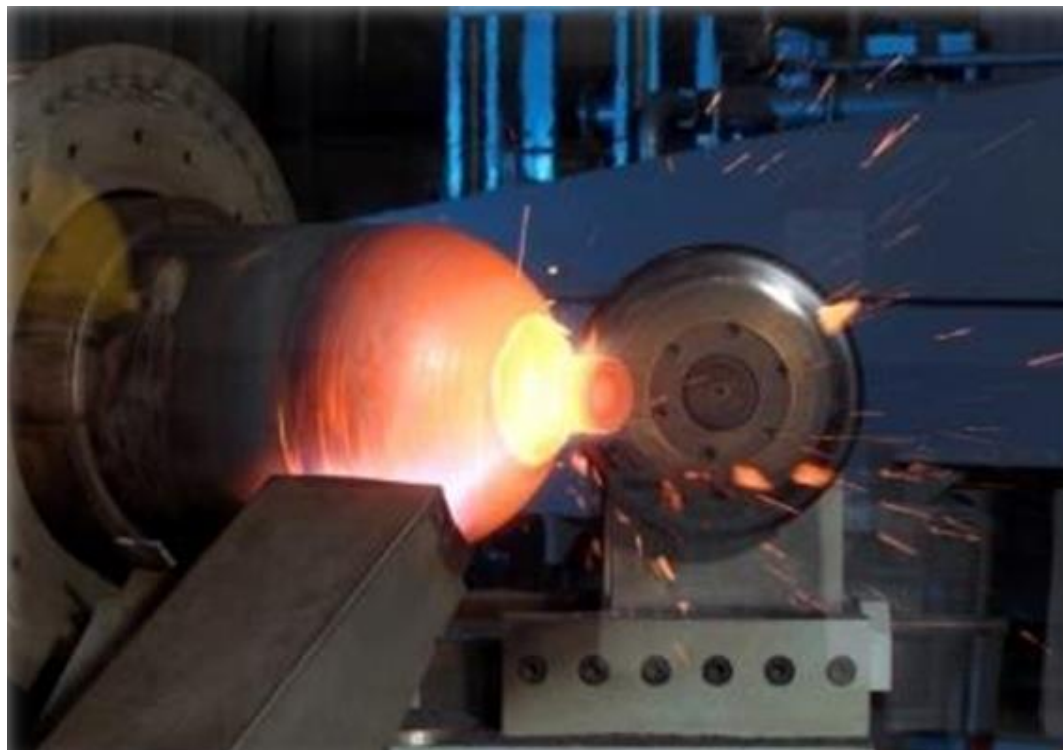


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FIBA Jumbo Tube
Manufacturing



- Each end is further formed to accept a bullplug





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Heat Treat Tubes

- After both ends are formed, the tube is heat treated and quenched in a hot oil bath



- Each end is then machined with a CNC to face and thread the neck for bullplugs

Tube Fabrication

- Each end is then machined with a CNC to face and thread the neck
- The interior and exterior are then shotblasted.
- The entire straight length of the tube is ultrasonically tested for any flaws, cracks, defects.



Tubes are filled with Abrasive Media



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Tubes are Spun at High Speeds



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Surface finish is measured



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Polish Tubes



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Check Machine Tube Threads



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Hot DI Water Wash

Collect sample to test for NVR



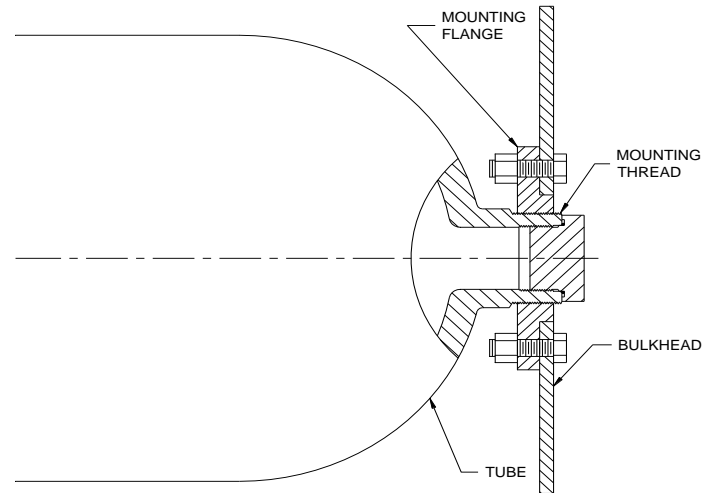
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Tubes

- The interior is then heated using supersaturated steam flowed by a nitrogen purge. The tube is then sealed for assembly.
- Each end is machined to 3 ¼” dia. opening which is plugged with a threaded Bullplug with Viton O Ring and Teflon backing ring



ISO Module: Tube Installation



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Bullplug

- Each end is machined to 3 ¼" threaded opening which is plugged with a threaded Bullplug, sealed with a Viton O Ring and Teflon Backing Ring. Surface finish of the bull plug and tube are critical for a good seal, the bull plug is torqued onto the end until the metal surfaces mate (800-1,000 ft-lbs).



Tube Fabrication, FIBA

- After they are mounted on the frame, the neck is further finished using 600 grit sandpaper and a polishing tool
- The bullplug is then installed using 1,000 lb torque



Vacuum Bake

- The tubes are then heated using a electric blanket to 120°F and a vacuum pulled on it. It is purged with Nitrogen and evacuated again to remove all moisture.



The tube skid built by FIBA is shot blasted prior to painting and is to be painted with high quality industrial grade marine coating. Coating shall be performed in accordance with FIBA Procedure FIBA-P-23 for the skid frame and tubes. All required decals, placards, and markings to be installed by FIBA in accordance with DOT and international regulations. Customer supplied logos can be installed by FIBA in accordance with drawing and DOT and ISO regulations.

Acoustic Emission Testing

- Tubes on a trailer are tested and inspected every 10 years using Hydrotest Acoustic Emission
- Acoustic Emission (AE) testing is preferred since the trailer does not have to be taken apart.
- Trailers must be built to accommodate AE testing. Tubes cannot touch
- Any area of concern must be further inspected using a UT tester



Silane Supply Options



~14 kg



140 kg



1000 kg



3000 kg

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4500 kg

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6000 kg



Bulk Silane ISO Module

- Use of a 40' 8 tube silane ISO Module reduces cylinder change frequency from 600 to 1.

Silane 20' ISO Module Supply 8 tube

- 20' 8 tube ISO Module
- 3,000 kgs
- 375 kg per tube
- 1450 psig @ 21°C



Silane 20' ISO Module Supply 12 tube

- 20' 12 tube ISO Module
- 4,500 kgs
- 375 kg per tube
- 1450 psig @ 21°C



Silane 40' ISO Modules Supply 8 tube

- 40' 8 tube ISO Module
- 6,000 kgs
- 750 kg per tube
- 1450 psig @ 21°C

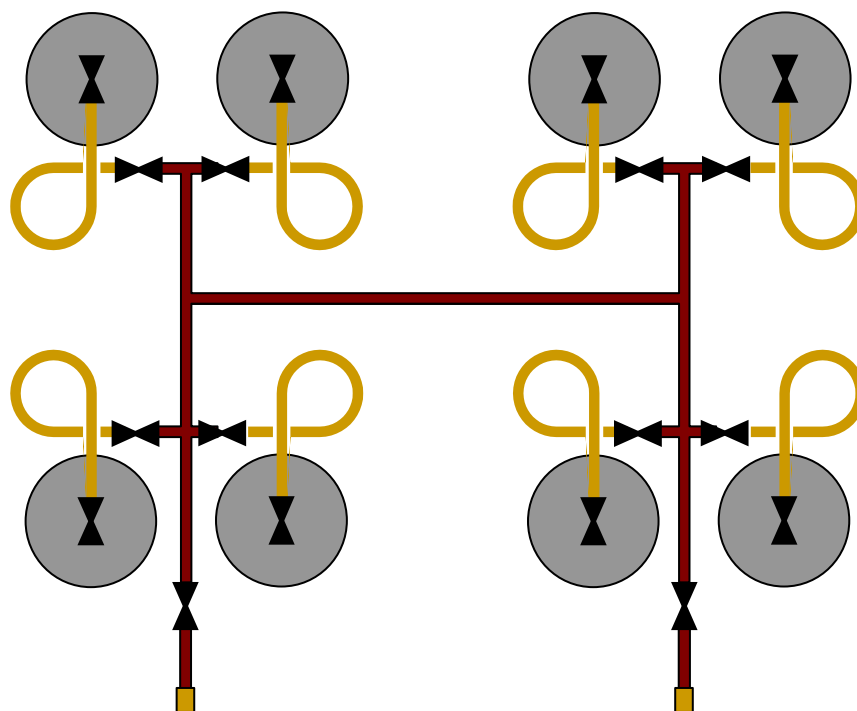


Silane ISO Module Container Terminology (REC Silicon)



Silane ISO Module Manifold

- Each ISO Module tube will have a valve
- Each tube has a manual valve for isolation in the event of a problem with the tube valve and to allow transportation without pressure in the manifold
- There are two ISO Module outlet connections and pneumatic control valves



Silane ISO Module Manifold

Key Advantage

- To minimize potential leak points, the only mechanical connection is the trailer manifold. Everything else is welded.
- The manifold is pressurized with Helium for shipment. The pressure will be noted on a tag
- If the pressure is lower than the tag, there is a leak on the manifold. No silane poppers
- The pneumatic valves will all be controlled from the master controller

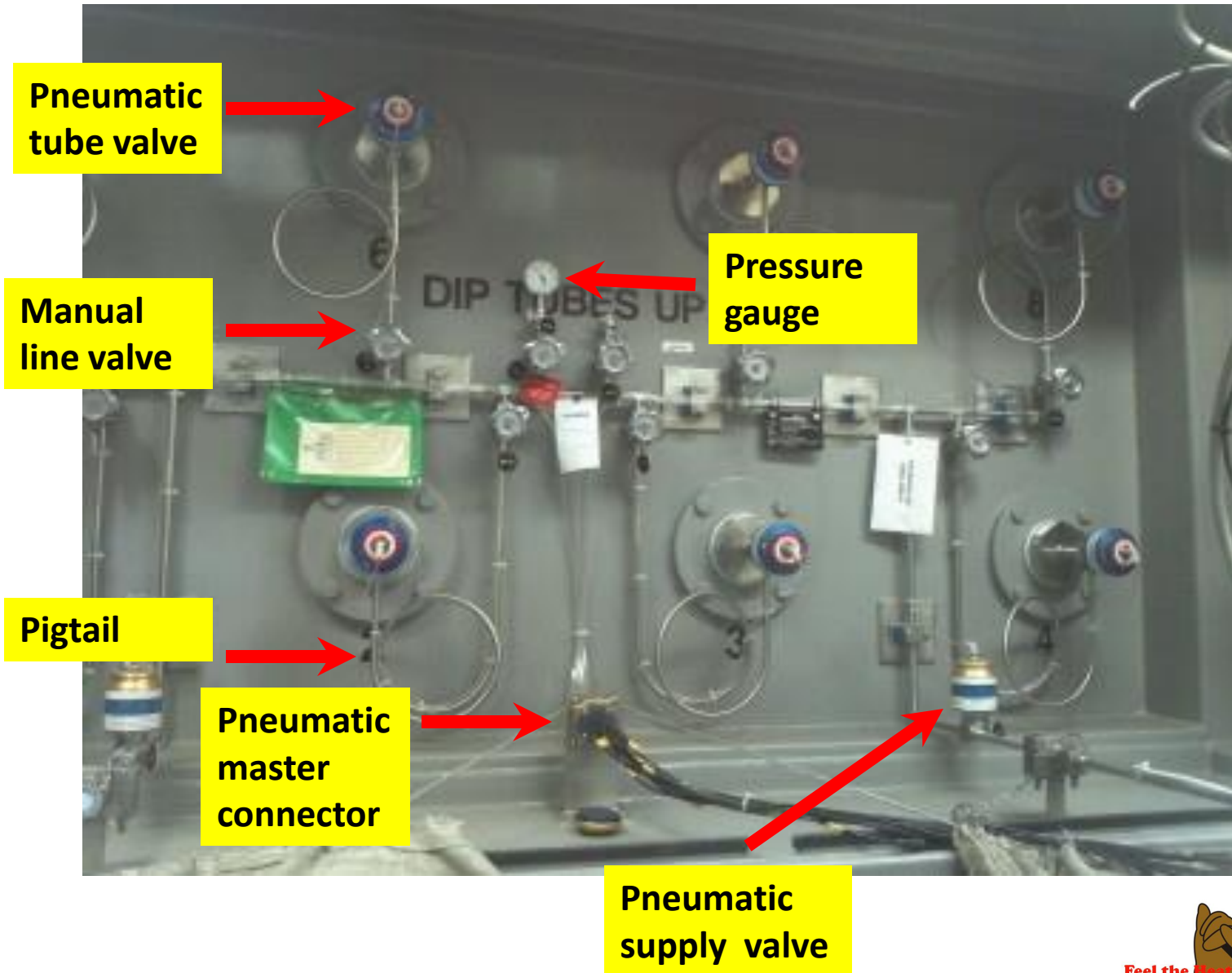
Each Company Has
Different Design

Silane ISO Module, No PRD with Pneumatic Tube Valves



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Air Liquide ISO Module



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