

# Light Weight Corrosion Resistant High Pressure

FLOWSTRONG® YELLOWBOX®



# RTR Line Pipe Solutions for Sour Hydrocarbon Service With High Water-Cut and for Water Injection Lines

## Applications

- Crude oil (containing H<sub>2</sub>S and CO<sub>2</sub>), as well as gathering systems
- Salt water injection lines
- Medium to high pressure transmission lines
- CO<sub>2</sub> injection and recovery lines
- Chemical effluent and waste disposal lines
- Water distribution systems
- Multiphase flow lines

## Product Introduction

Flowstrong® YellowBox® line pipe is a machine-made composite material produced by the filament winding method combining high strength continuous glass fiber filaments and corrosion resistant epoxy resin onto a steel mandrel. The material is specially formulated to result in a structurally and chemically optimized product. The resin system employed is a Bisphenol-A based epoxy resin heat cured with an aromatic amine based hardener; this formulation produces the highest mechanical strength, temperature resistance and corrosion resistance of all commercially available resin systems used in fabrication of fiberglass piping.

Flowstrong® YellowBox® pipe systems incorporate threaded joints which utilize the reliable, time-proven 8 round (8RD) threads made as per API specification 5B for diameters below 12". For 12" diameter and above, FPI's proprietary 4 round (4RD) thread is utilized. Joint sealing is obtained with fiberglass material itself; sealing strength is enhanced by means of high-performance Composite Molded Threads. Steel threaded molds are utilized during production with a benefit of increasing reliability, repeatability and performance over traditional machined threads.

Success story: More than 60KM of high pressure Flowstrong® YellowBox® line pipe installed in ADCO with Zero-Leakage during testing, commissioning and in-service.

## Design Summary

Flowstrong® YellowBox® line pipe is designed as per API specification 15HR, and further enhanced to satisfy requirements of Saudi Aramco specification 01-SAMSS-042 for temperature resistance of up to 95°C (203°F).

All of the below given parameters of Flowstrong® YellowBox® line pipe systems comply with the requirements stated in API 15HR (specification for high pressure fiberglass line pipe):

- Pipe inside diameter
- Pressure rating and pipeline design methodology
- Service life
- Long term & short term hydrostatic and mechanical strength
- Raw material control
- Manufacturing process
- Process control and quality control
- Visual and dimensional control
- Marking
- Performance verification testing
- Handling, packaging, storing and shipping
- Minimum bending radius of pipeline







## Product Range (Pressure vs. Diameter)

Applicable Aramco specification: 01-SAMSS-042

Applicable international specification: API SPEC 15HR

| Aramco Range for up to 95°C (203°F) |                 |          |          |          |          |          |           |           |           |           |
|-------------------------------------|-----------------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|
| Nominal pipe size                   | Inside Diameter | 500 PSI  | 750 PSI  | 1000 PSI | 1250 PSI | 1300 PSI | 1500 PSI  | 1750 PSI  | 2000 PSI  | 2250 PSI  |
|                                     |                 | 34.5 bar | 51.7 bar | 69 bar   | 86.2 bar | 89.6 bar | 103.4 bar | 120.7 bar | 137.9 bar | 155.1 bar |
| 3"                                  | 76 mm           | ✓        | ✓        | ✓        | ✓        |          | ✓         | ✓         | ✓         | ✓         |
| 4-M                                 | 100 mm          | ✓        | ✓        | ✓        | ✓        |          | ✓         | ✓         | ✓         | ✓         |
| 6"                                  | 138 mm          | ✓        | ✓        | ✓        | ✓        |          | ✓         | ✓         |           |           |
| 8-M                                 | 200 mm          | ✓        | ✓        | ✓        | ✓        |          | ✓         |           |           |           |
| 10"                                 | 225 mm          | ✓        | ✓        | ✓        | ✓        |          |           |           |           |           |
| 12-M                                | 300 mm          | ✓        | ✓        | ✓        | ✓        |          |           |           |           |           |
| 14"                                 | 334 mm          | ✓        |          | ✓        |          | ✓        |           |           |           |           |
| 14M                                 | 350 mm          | ✓        |          | ✓        |          | ✓        |           |           |           |           |
| 16"                                 | 368 mm          | ✓        |          | ✓        |          | ✓        |           |           |           |           |
| 16M                                 | 400 mm          | ✓        |          | ✓        |          | ✓        |           |           |           |           |

### Notes:

✓: Product is available; maximum site hydro test pressure = 1.25 x Pressure rating

## Overview of Installation Method

Flowstrong® YellowBox® pipe systems incorporate threaded joints wherein the male end (pin) is carefully inserted into the female end (box). After ensuring correct alignment, the pin is rotated into the box until a pre-defined torque or a pre-defined depth of penetration is achieved. Joint sealing is obtained with fiberglass material itself, assisted by the use of a thread compound or a thread sealant at the interface of pin and box. Joint installation is relatively fast, wherein it is possible to install up to 400 metres of pipeline per day.



## Reference List

Flowstrong® YellowBox® line pipe has more than 20 years of case histories, only an extract of those installations inside the GCC is shown below:

Reference List for High Pressure API Threaded YellowBox® Line Pipe in the GCC

| Order Date | Product    | Business Partner                   | Item Description         | Unit | Order Qty |
|------------|------------|------------------------------------|--------------------------|------|-----------|
| 2012       | Yellow Box | ARAMCO                             | 6" – 8"                  | ft   | 12553     |
| 2012       | Yellow Box | ARAMCO                             | 6" – 8"                  | ft   | 14731     |
| 2012       | Yellow Box | ARAMCO                             | 14"                      | ft   | 20816     |
| 2016       | Yellow Box | Kinder Morgan Production Co        | 10", 14", 3", 4", 6", 8" | ft   | 85395     |
| 2016       | Yellow Box | Pintail Oil and Gas                | 3"                       | ft   | 1050      |
| 2016       | Yellow Box | Weatherford Gemoco                 | 3" & 4"                  | ft   | 4470      |
| 2016       | Yellow Box | ARAMCO                             | 6",8"                    | ft   | 133,000   |
| 2017       | Yellow Box | ARAMCO                             | 6",8"                    | ft   | 2,125,826 |
| 2017       | Yellow Box | Kinder Morgan Production Co        | 4", 10" & 12"            | ft   | 24800     |
| 2017       | Yellow Box | EOG Resources, Inc.                | 10"                      | ft   | 6000      |
| 2017       | Yellow Box | Sheridan Production Co LLC         | 10"                      | ft   | 14000     |
| 2017       | Yellow Box | Apache                             | 3", 4", 6", 8", 10"      | ft   | 91550     |
| 2017       | Yellow Box | Great Western                      | 4" & 6"                  | ft   | 7400      |
| 2017       | Yellow Box | Surge Operating LLC                | 6"                       | ft   | 33100     |
| 2017       | Yellow Box | Hunt Oil Company                   | 6"                       | ft   | 5000      |
| 2018       | Yellow Box | ARAMCO                             | 6",8",10",12",14"        |      | 1,330,088 |
| 2018       | Yellow Box | Kinder Morgan Production Co        | 6", 10", 12"             | ft   | 22660     |
| 2018       | Yellow Box | COG Operating LLC                  | 12" YB TC 1000           | ft   | 94000     |
| 2018       | Yellow Box | Rhame Pump Repair & Supply         | 3"                       | ft   | 2900      |
| 2018       | Yellow Box | Trinidad Resources LLC             | 3"                       | ft   | 5083      |
| 2018       | Yellow Box | Trinidad Resources LLC             | 4"                       | ft   | 2000      |
| 2018       | Yellow Box | Steward Energy II                  | 6"                       | ft   | 7000      |
| 2018       | Yellow Box | Goodnight Midstream                | 6"                       | ft   | 121900    |
| 2018       | Yellow Box | Excelsior Mining Arizona Inc       | 8"                       | ft   | 2160      |
| 2019       | Yellow Box | Goodnight Midstream                | 6"                       | pc   | 10000     |
| 2019       | Yellow Box | Kinder Morgan                      | 3", 6", 10", 12", 16"    | ft   | 69010     |
| 2019       | Yellow Box | Apache Corporation                 | 12"                      | ft   | 23000     |
| 2019       | Yellow Box | Spirit Oilfield Supply, Inc.       | 3"                       | ft   | 2000      |
| 2019       | Yellow Box | BDS Constructors / MK Constructors | 2", 3", 6"               | ft   | 1275      |
| 2020       | Yellow Box | Cressman Tubumars                  | 4"                       | LF   | 3000      |
| 2020       | Yellow Box | XTO Energy                         | 6"                       | LF   | 4710      |
| 2020       | Yellow Box | Colgate Energy                     | 12"                      | ft   | 5500      |
| 2020       | Yellow Box | TPAO                               | 6"                       | ft   | 106,627   |
| 2021       | Yellow Box | GPC                                | 6",8"                    | ft   | 104,239   |





