



The Evolution & Future of API Coiled Tubing Standards

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API Co-Chairman Resource Group for Coiled Tubing

Presentation Outline

- API Overview
 - Resource Group on Coiled Tubing
- API CT Documents
 - RP 5C7
 - RP 16ST
 - 5ST
- API Certification Process
- Future Plans for API CT Documents
 - RP 5C8

API Overview / Background

What is API?

- American Petroleum Institute
 - Trade association representing all aspects of America's oil and natural gas industry
 - Areas of work within API:
 - Advocacy
 - Research & Statistics
 - Standards
 - Certification
 - Education

API Standards Structure

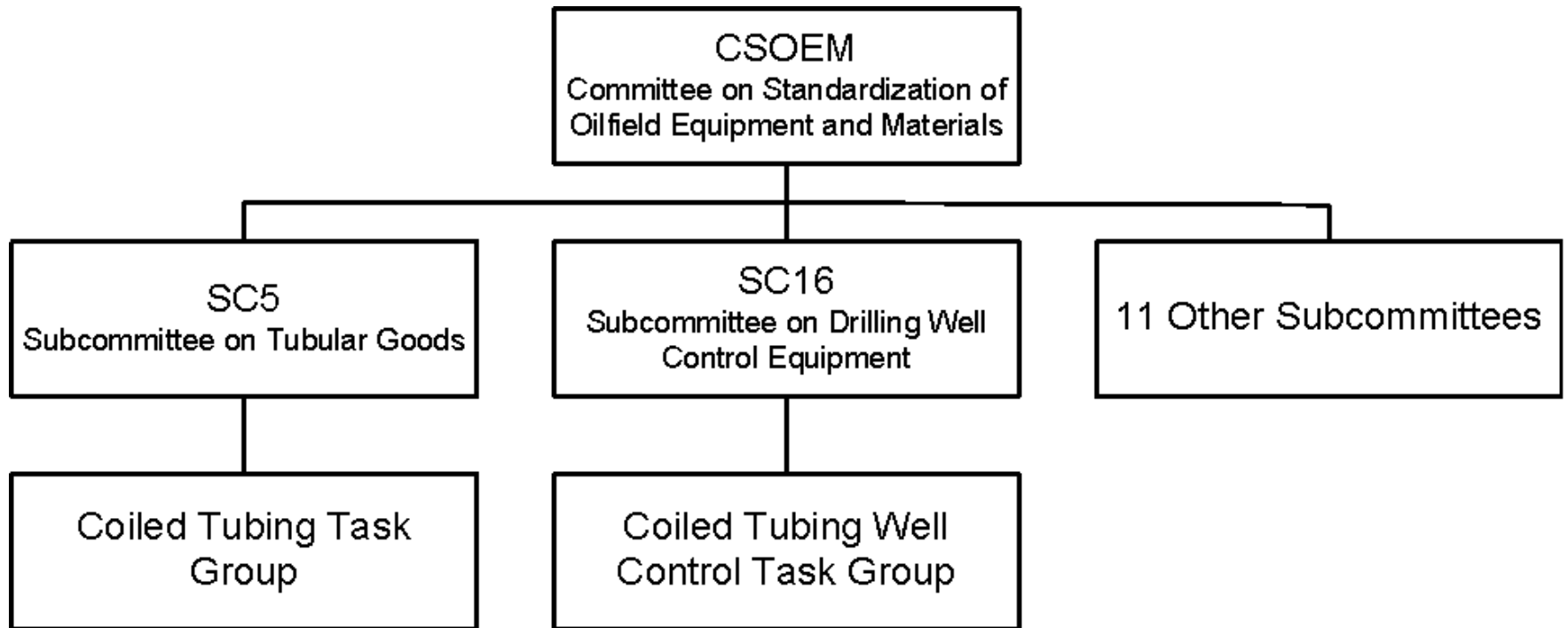


- API started publishing standards in 1924
- Currently over 500 standards are controlled
- API is an American National Standards Institute (ANSI) accredited standards developing organization.
- API produces standards, recommended practices, specifications, technical publications, reports and studies that cover each segment of the industry.

API Standards Structure

- All standards are controlled by the Committee on Standardization of Oilfield Equipment and Materials (CSOEM)
- This committee is broken into 13 different subcommittees
- The committee directly related to Coiled Tubing is Subcommittee 5 (SC5) for Tubular Goods.

API Standards Structure



API Subcommittee 5

- The subcommittee is further broken into the following Task/Resource Groups:
 - OCTG (Casing, Tubing & Drill Pipe)
 - Pipe Threads
 - Coiled Tubing
 - Line Pipe
 - Drill Stem Equipment

API Resource Group on Coiled Tubing

- Scope:
 - Maintain current standards (5LCP, 5ST)
 - Currently working on RP 5C8 (Care & Maintenance of CT)
 - Propose and work on items relevant to coiled tubing
- Participation:
 - CT Manufacturers and service companies, Integrated oil & gas companies, consultants

API Coiled Tubing Documents

- RP 5C7 – Recommended Practice for Coiled Tubing Operations in Oil and Gas Well Services
- RP 16ST – Recommended Practice for Coiled Tubing Well Control Equipment
- 5ST – Specification for Coiled Tubing
- RP 5C8 – Recommended Practice for Care & Maintenance of Coiled Tubing
- 5LCP – Specification for Coiled Line Pipe

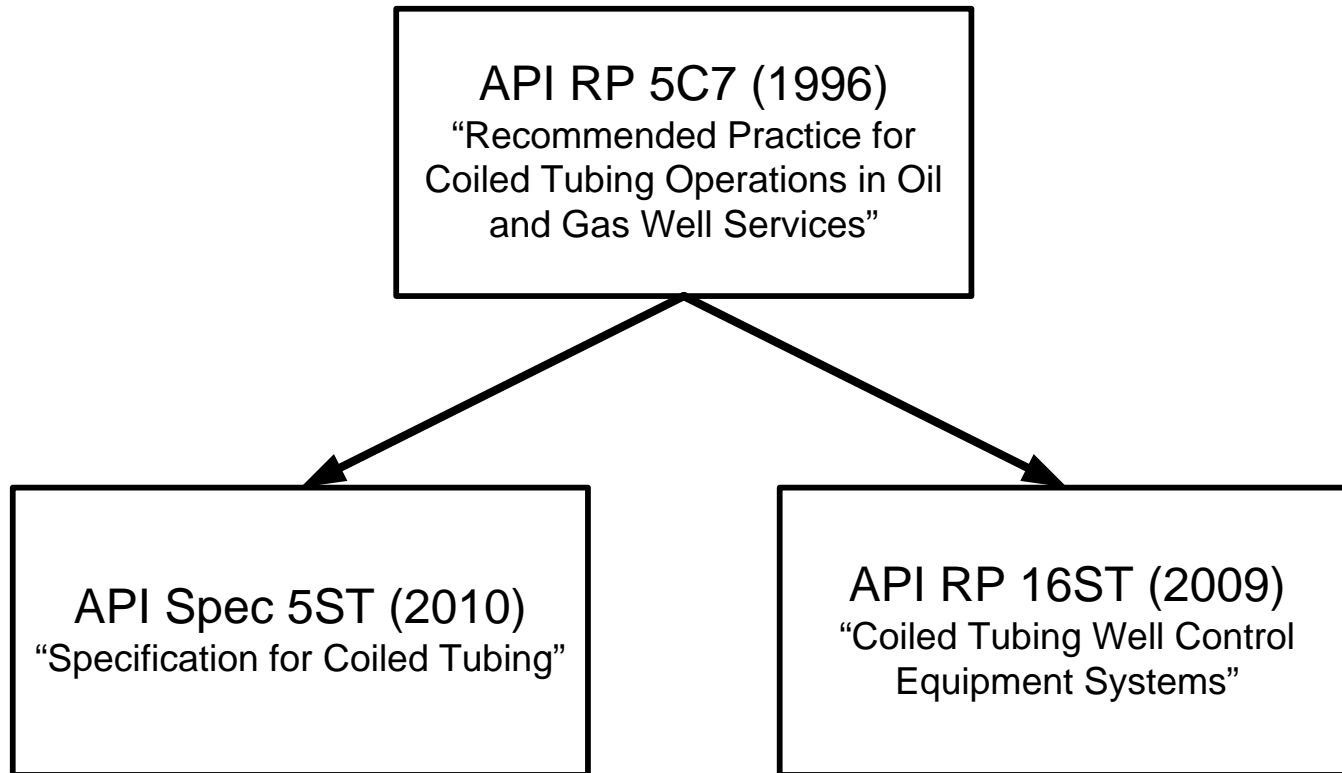
API RP 5C7 – Recommended
Practice for Coiled Tubing
Operations in Oil and Gas Well
Services

API RP 5C7

- History:
 - Created in 1996 to meet the need for design and operating recommendations for the CT industry
 - Re-affirmed twice before being withdrawn in 2009
- Scope:
 - Mainly for cased hole work overs and drilling, with some manufacturing properties included
- Impact:
 - Misplaced as main focus was about well control and drilling, and issued within the tubing subcommittee.

API RP 5C7

Most of the document moved to RP 16ST with manufacturing related areas moved to 5ST



API RP 16ST – Recommended Practice for Coiled Tubing Well Control Equipment

API 16ST

- History:
 - First Edition in 2009; born from data within RP 5C7, and expanded with help from more relevant resource group
- Scope:
 - Well control equipment assembly & operation used in CT intervention and drilling applications

API 16ST

- Comparison with IRP-21:
 - IRP-21 is broader in scope, the common element is well control
 - 16ST has no reference to sour service
- Impact:
 - Some US companies are advertising compliance with this RP.

API 5ST – Specification for Coiled Tubing

API 5ST – Specification for Coiled Tubing

- History:
 - Began as a draft in late 90's early 00's, but was never embraced by manufacturers.
 - Manufacturer involvement in 2007 revived the draft with further development leading to approval and release for use in 2010

API 5ST – Specification for Coiled Tubing

- Scope:
 - Controls the requirements for the manufacturing of down hole coiled tubing:
 - » Material Requirements
 - » Chemistry, Properties
 - » Processes of manufacture
 - » Welding, traceability
 - » Dimensional requirements
 - » OD, Wall Thickness
 - » Testing
 - » Destructive and Non-Destructive
 - » Marking
 - » Tubing identification
 - » Document Control
 - » Certifications

API 5ST – Specification for Coiled Tubing

- Comparison with IRP-21:
 - Small differences in mechanical properties and chemistry requirements
 - More in depth mechanical properties and NDT as IRP-21 is more field related in content
- Impact:
 - Filled a gap where no specification for manufactured coiled tubing existed.

The API Certification Process

API Certification Process

- Manufacturer must have an accredited Quality Management System (QMS) that meets the standards of API Q1 or ISO 9001.
- A full audit is performed by API of the product and process per the relevant standard:
 - API 5LCP – Specification for Coiled Line Pipe
 - Used for TCT pipeline projects and products (X65, X70 tubing grades)
 - API 5ST – Specification for Coiled Tubing
 - Used for TCT downhole products (CT70, CT80, CT90 and CT110)

API Certification Process

- Tenaris is approved to manufacture product in accordance with 5LCP (License #: 5LCP-0001) & 5ST (License #: 5ST-0001)
- Currently the only manufacturer licensed to manufacture and monogram coiled line pipe and coiled tubing products in accordance to these standards.

Future of API Coiled Tubing Standards

- API RP 5C8 – Recommended Practice for Care & Maintenance of CT
 - Provide definitions/glossary of terms related to CT
 - Properties influence on used CT
 - Corrosion and impact to serviceability
 - NDE of used CT
 - Welding of used CT
 - Assessment of fatigue and impact to serviceability
 - Photographs of manufacturing & field related defects

Future of API Coiled Tubing Standards

- API 5ST– Specification for Coiled Tubing
 - Inclusion of ultrasonic inspection option for bias welds
 - Qualification standards for new coiled tubing grades and raw material sources

Future of API Coiled Tubing Standards

- Fatigue
 - Resource group has identified this as a key performance property.
 - Work Item currently to address a standard fatigue test.
 - Potential for technical brief or recommendations to include:
 - Different types of fatigue test machines
 - Standards for testing (orientation of welds, number of tests, etc...)
 - Goal is to educate people on fatigue testing and work towards harmonizing the results obtained from these tests.

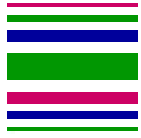
Future of API Coiled Tubing Standards

- Sour Service
 - Resource group has identified this as a key performance property.
 - Currently no work item exists to address CT in sour environments
 - While currently little push within the group, this could be a future endeavor to benefit the coiled tubing industry.

Summary

- API has a resource group that works specifically on coiled tubing
- A specification (API 5ST) has been published for procurement of coiled tubing
- The future of API coiled tubing documents includes:
 - RP on care & maintenance (5C8)
 - Upgrades to the manufacturing specification (5ST)
 - Potential technical briefs about fatigue and sour service

? Questions ?



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