

# SHOULD API SUCKER RODS AND COUPLINGS BE CONSIDERED AS “COMMODITIES”?

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## ABSTRACT

Commodities are defined relative to their application. There are dictionary definitions of the word commodity. There also are definitions of commodities related to the specific good or service that is being considered or traded on one of the many financial boards in the world. For these commodities, there is a “benchmark” that has been defined, standardized, and accepted for base price determination. However, there are multipliers that are used to differentiate the products that exceed or do not meet the benchmark requirements.

This paper will discuss commodities and related benchmarks along with providing information related to the API Specification 11B and its requirements for standard sucker rods and couplings. Additionally, specific requirements in the standard are highlighted that provide quality and performance expectations but show dependency on the manufacturers’ internal controls or procedures. Also discussed is that the oil and gas industry have not developed a benchmark for sucker rods and couplings (as well as many “standard” products) since each manufacture does not use the same, standard processes and procedures. Thus, procurement/purchasing organizations should consider all the manufacturing processes and procedures to compare the equipment produced and not try to compare these products on price alone.

## WHAT IS A COMMODITY?

The *Merriam-Webster Dictionary* defines a commodity as:

- An economic good;
- A mass-produced, unspecialized product;
- A good or service whose wide availability typically leads to smaller profit margins and diminishes the importance of factors (such as brand names) other than price.

Others may use similar concepts but with different words, such as:

- A commodity is a product that is sold without differentiation by all suppliers;
- Although any good or service can be a “commodity” if it sold by many suppliers in an undifferentiated fashion;
- The term ‘commodity’ generally refers to physical goods which are building blocks of more complex products and are traded on commodity exchanges such as the Chicago Board of Trade (CBOT) or the New York Mercantile Exchange (NYMEX).

There are many major commodity traded at these financial institutions. These include: agricultural, livestock, precious metals, industrial metals, and energy. The following lists these common commodity groups along with examples of some of the included products.

- Agricultural
  - Corn, oats, soybeans, wheat, milk, coffee, cotton, sugar, and orange juice.
- Livestock
  - Lean hogs, pork bellies, live cattle, and feeder cattle.
- Precious metal
  - Gold, silver, and platinum.
- Industrial Metal
  - Aluminum, copper, nickel, lead, zinc, tin, and molybdenum.
- Energy
  - Ethanol, natural gas, heating oil, propane, and the following crude oil classifications - Dubai, OPEC Reference Basket, Brent (blend) and West Texas Intermediate (WTI).

The most common crude oil traded is Brent crude. This is a blend of Brent Sweet, Light Crude, Oseberg, Ekofisk and Forties crude (BFOE). This blend is used to compare other crudes to compare their properties to this blend and determine the inherent price the refineries will pay for a specific crude oil. Approximately two-thirds of the world's internationally traded crude oil supplies is priced reference to the Brent blend.

WTI is a light crude oil with an API gravity of around 39.6 and specific gravity of 0.837. This crude is lighter than the Brent blend. It contains about 0.24% sulfur which provides the rating as a sweet crude (having sulfur  $\leq 0.5\%$ ) and is sweeter than Brent crude. This crude typically has a sulfur content of 0.37%. WTI is refined mostly in the Midwest and Gulf Coast regions in the U.S.

Once the benchmark properties are defined and the specific price is determined for the quality/requirements for that commodity, then the relative price can be established for other commodities in a group by comparing its quality/requirement versus the benchmark. Typically the pricing is provided on the spot market or from future expected price. The multipliers can be greater or less than 1.0 depending if the actual produced good has better or worse quality/requirements than the benchmark.

### API Specification Background

The America Petroleum Institute (API) published the first oil and gas industry standard in 1924. This was API Specification 11B "Sucker Rods." This was the first standard developed to provide requirements to the many manufacturers of the products covered in the specification to assure they meet minimum performance requirements and the products could be interchangeable. This spec has evolved since the 1920s with prescriptive manufacturing and performance and quality requirements with various degrees of detail provided in the standard.

The latest API Spec 11B had its title expanded to signify all the products that are controlled by this standard. Its new title is: "Specification for Sucker Rods, Polished Rods and Liners, Couplings, Sinker Bars, Polished Rods and Clamps, Stuffing Boxes, and Pumping Tees." It was published by API in May 2010 as the 27<sup>th</sup> edition and was effective Nov 1, 2010. The volunteers on the API task group provided a complete revision to this standard with general requirements that normally apply separated from the product/equipment requirements. These product/equipment requirements were then separated and listed in the various, separate annexes.

### API SUCKER ROD REQUIREMENTS

The major manufacturing and dimensional requirements for sucker rods were not changes in this latest edition. The main changes were to better describe and control end straightness and total indicator run-out (TIR).

The minimum chemical composition and tensile load capabilities were listed as the same. However, now minimum yield strength requirements have been established for the common API rod grades.

Table I shows the American Institute of Iron and Steel's various alloy classifications for the chemical composition of the various listed API rod grades. It should be noted that neither the minimum nor the maximum amount of the major hardness and strength controlling element, carbon, has the requirements listed. This is listed as the "xx" in each alloy classification.

Table II provides the same tensile and new yield strength, mechanical properties requirements for the three different API rod grades. It should be noted that the spec requires a minimum of two tests on at least two rod bodies at the beginning and the end of the heat. The tests have to be conducted after final thermal processing. If the heat treated test rods fail to meet the mechanical properties required, then the heat may be reprocessed and accepted if the retests pass. There is no limit in the spec for the number of times the steel can be reprocessed but some rod manufacturers may limit the number of reheat to one or possibly two. Additionally, some manufacturers may not process an entire heat of steel bars all at a time and only a smaller batch may be processed. When this is done, some manufacturers may continue to check test rods at the beginning of each batch. There also is no requirement where along the rod length that the test sample maybe obtained nor how many samples should be obtained.

### COUPLNG REQUIREMENTS

The API coupling dimensional requirements and tolerances are the same in the latest edition as the previous. The chemical composition requirement has not been changed either. But, the spec requires that the composition shall be per the manufacturer's specs but include a maximum amount of sulfur of 0.05%. Additionally, the composition needs to be checked only once per mill heat.

Mechanical property requirements also have not been changed; but, again these requirements are per the manufacturer's spec and the material have a minimum tensile strength of 95,000 psi. However, the spec provides that conformance to the strength can be demonstrated by one of three ways. These include:

- Conducting a hardness test with results of 56 to 63 Rockwell Hardness – A scale (HRA),
- Obtaining a material test report for the heat of steel from the mill; provided that further processing does not change the properties, or
- Conducting a tensile test with a minimum of two tests performed after the final thermal processing (however, it is difficult to test a 4" long sample).

## DISCUSSIONS

Comparing the requirements for commodities and commodity trading to sucker rods, couplings and other associated oil and gas production equipment, one can quickly conclude that the equipment should not be considered "commodities" since the industry have not developed the actual benchmarks for comparing manufacturer's, their specifications, processes, procedures and quality. Each manufacturer has different chemical composition ranges and heat treatment procedures. Each manufacturer has different, "guaranteed" or internal mechanical property requirement and testing procedures. Each manufacturer has different in-process procedures and quality/inspection checking frequencies (which meet the minimum requirement of American Society for Quality (ASQ) level of 4% for sucker rods and a minimum of 10% for couplings

Furthermore, not covered by the specification are technical support requirements to assist the producing company. Each manufacturer has different levels of support with different qualification of the support of the representatives (if they have any at all).

All of the various factors including, specifications, processes, procedures, testing, inspecting, quality, and technical support capabilities need to be compared to make the best decision when selecting an equipment manufacturer.

While the differences in pricing may be an indication of the capabilities, quality and performance of the equipment, the only way to know what the differences are is to make these detailed comparisons (and remember, even though there is a minimum industry standard for production equipment, not all manufacturers strive to only supply the minimum requirements).

## CONCLUSIONS and RECOMMENDATIONS

1. While some may try to commoditize sucker rods and/or couplings since they assume that all manufacturers meet the minimum requirements in the industry standard; but, not realizing the standard leaves many requirements still up to the manufacturer.
2. Sucker rods and couplings manufactured to the minimum requirement of API Specification 11B are not "unspecialized" since each manufacturer uses their internal special processes and procedure to produce their products.
3. While these products are widely available, the importance of the manufacturer's brand name and/or trademarked processes provides their variable quality and process controls that they choose to apply to their products.
4. While there is an industry minimum specification for this production equipment, there has not been a benchmark established to make comparisons between manufacturers or their equipment.
5. Since the price for the equipment does not provide sufficient detail to know the quality or performance of the equipment, the producer and their procurement/purchasing department and personnel should not try to commoditize this equipment.

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Table I  
The Grades and Minimum Composition Requirement for API Sucker Rods

API Grade	Chemical Composition Grade Requirement
K	AISI 46XX
C	AISI 10XX
	AISI 15XX
D – carbon	AISI 10XX
	AISI 15XX
D - alloy	AISI 41XX
D – special alloy	Special alloy containing a combination of Ni, Cr, and Mo with total minimum of the alloy o by 1.15%

Table II  
Mechanical Property Requirements for API Rod Grades

Grade	Min Yield (0.2%), psi	Min Tensile (psi)	Max Tensile (psi)
K	60,000	90,000	115,000
C	60,000	90,000	115,000
D	85,000	115,000	140,000