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MOP, MAOP, DP AND MAWP – UNDERSTANDING THE DIFFERENCES TO AVOID UNNECESSARY COSTS

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ABSTRACT

The ASME pressure vessel and piping codes and standards provide excellent references for code writers in international jurisdictions when developing their own national codes and for safety authorities when developing regulatory acts. The inclination to customize this effort may add unnecessary complexity that unintentionally obscures the underlying engineering principles.

In developing the Canadian pipeline code, the authors use the notion of maximum operating pressure or MOP similar to the MOP found in the ASME codes for pipelines. While the ASME code definitions are explicit and articulate, the MOP defined in the Canadian code is less so and has led to inadvertent confusion by industry users. Misunderstanding of complementary terminology used in ancillary ASME standards has contributed to further complexities. The use of the term, maximum allowable operating pressure or, MAOP in the ASME pipeline codes has further reduced clarity when integrating this term into international codes and regulatory acts.

This paper examines, in detail, some aspects of the Canadian pipeline code and illustrates via a representative case study some of the aforementioned difficulties that have arisen. These difficulties resulted in unnecessary derating of assets by imposing operational limits that were well below actual capacity. A clear explanation of the engineering principles underlying the provisions for codes which use a "design by rules" philosophy will help operators set appropriate limits for both static and dynamic loads that may not be apparent in the specific codes considered and will be expository for regulators and code users in general.

INTRODUCTION

Pressure vessel and piping codes have provided protection for the public and environment with respect to catastrophic failures for nearly a century. By the 1880's, exploding boilers in the United States of America, had caused 50,000 deaths and 2 million people were being injured annually in a national population of 50 million. These dreadful statistics prompted development of a boiler test code in 1884 and subsequently, the ASME boiler and pressure vessel construction code in 1915. Piping code development was initiated in 1926 and the first piping code was published in 1935. This single code was later specialized along industry lines with ASME B31.8 Gas Transmission and Distribution Piping Systems published in 1955 and ASME B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids in 1959. The success of these Codes is well recognized.

In Canada, until 1967, the two referenced ASME piping codes (collectively, the "Code") were used explicitly since the first editions of separate Canadian oil and gas pipeline standards referenced use of the ASME Codes without modification. Since 1994, the Canadian standards have been combined into a single document entitled Canadian Standards Association CSA Z662, Oil and Gas Pipeline Systems (the "Standard") [1]. As with its predecessor codes, CSA Z662 advises that it is a consensus document, providing requirements considered to be adequate under conditions normally encountered in the oil and natural gas pipeline industry but not prescribing requirements for abnormal or unusual conditions. Individual pipeline owners and contractors commonly have their own engineering standards that reference CSA Z662 as the base case, and then specify additional requirements that must be met considering the specifics of their particular situation, experience and preferences. The Standard appeals to good engineering practice in a number of instances and similar to the ASME Codes, it also declares that it is not a design handbook and competent engineering judgment should be employed with its use.