TECHNICAL BULLETIN

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ACETYLENE PLANT SAFE OPERATING PRESSURES AND TEMPERATURES

Question

What are the operating pressure and temperature limits for acetylene production plants to keep acetylene in the gaseous phase instead of the more unstable liquid phase?

Answer

The graph of vapour pressure versus temperature is referred to as the Mollier curve, see Figure 1. The curve shows the transition point from gaseous to liquid phase over a range of pressures and temperatures. Acetylene at any pressure-temperature combination below the curve is in the gaseous phase. Acetylene at any pressure-temperature combination above the curve is in the liquid phase. Maintaining the pressure-temperature combination of the acetylene below the curve will keep acetylene in the gaseous phase.

Operating pressure and temperature limits in CGA, EIGA, and NFPA publications are below the Mollier curve in the gaseous phase for acetylene [1, 2, 3].

WARNING: Liquid acetylene has a high explosive potential and shock sensitivity higher than that of gaseous acetylene. For these reasons, acetylene shall not be liquefied.

Methods recommended to keep acetylene in the gaseous phase:

1. Determine the minimum expected temperature for the plant location. For that temperature, determine the maximum operating pressure so the pressure-temperature combination will keep the acetylene in the gaseous phase. Design the plant to maintain the operating pressure below that maximum operating pressure.

NOTE Regulations in certain countries prescribe the maximum operating pressure of acetylene plants.

2. Determine the maximum operating pressure of the plant. For that pressure, determine the minimum temperature so the pressure-temperature combination will keep the acetylene in the gaseous phase. Design the plant to shut down when the temperature drops to the minimum set point.

NOTE Maximum operating pressure is the maximum pressure at which the process is intended to operate. This determines the maximum setting of the high-pressure switch or the minimum setting of the low temperature switch.

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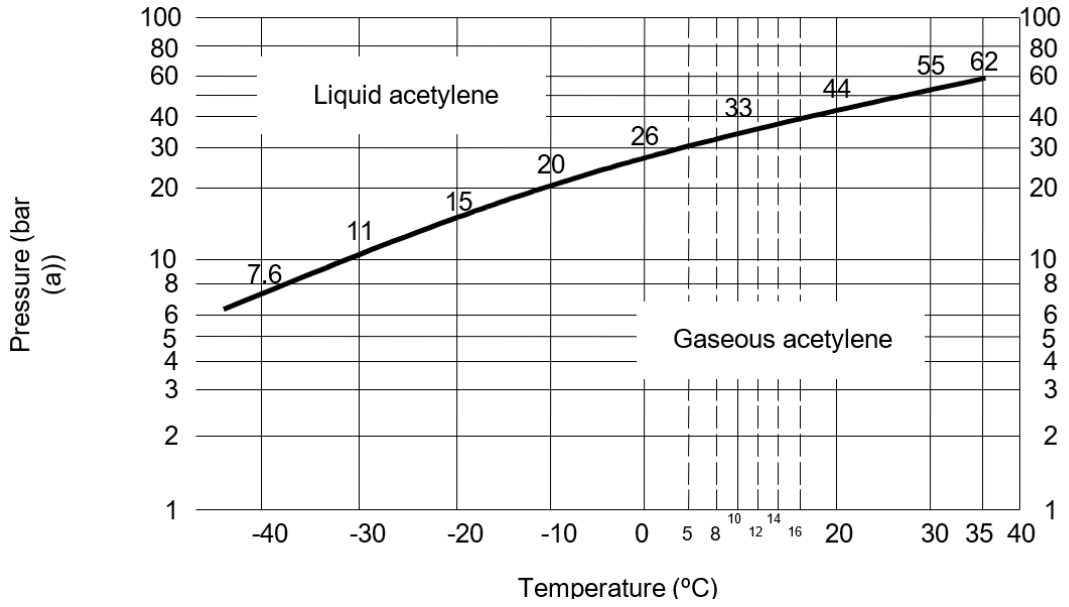

Figure 1—Mollier curve for acetylene [1]

Reasons

For gaseous acetylene at a given pressure-temperature combination, raising the pressure, lowering the temperature, or both can move the pressure-temperature combination closer to the Mollier curve. Continued increase in pressure, decrease in temperature, or both can move the pressure-temperature combination above the Mollier curve, which will change gaseous acetylene to liquid acetylene.

References

Unless otherwise specified, the latest edition shall apply.

[1] EIGA Doc 123, *Code of Practice: Acetylene*, European Industrial Gases Association. www.eiga.eu

[2] CGA G-1.6, *Standard for Mobile Acetylene Trailer Systems*, Compressed Gas Association, Inc. www.cganet.com

[3] NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, National Fire Protection Association. www.nfpa.org

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