Process Information: *SIZING for two phase liquid/vapor relief*

Note: Please supply this iformation along with typical data sheets for each tag number.

REFERENCE to: api recommended practice 520 EIGTH edition,

DECEMBER 2008, sizing, *selection, and installation of*

*pressure-relieving devices in refineries: part i*

*sizing and selection.*

the following excerts are taken from the api 520 8th edition and can be used to identify which TWO-PHASE liquid/vapor relief scenario (According to api 520 8TH) fits your application. Proceed to the corresponding method and fill in the needed process information.

**corresponds to api method C.2.2 (Formerly D.2.1)**

**1A.** Two-phase system (saturated liquid and saturated vapor) enters the PRV and flashes. No noncondensablea gas present. Also includes fluids both above and below the thermodynamic equilibrium point in condensing two-phase flow.

 Example: Saturated liquid/vapor propane system enters PRV and the liquid propane flashes.

Proceed to ***Method 1*** with Process Information if this scenario represents your application.

**1B.** Two-phase system (highly subcooledb liquid and either non-condensable gas, condensable vapor or both) enters PRV and does not flash.

 Example: Highly subcooled propane and nitrogen enters PRV and the propane does not flash.

Proceed to ***Method 1*** with Process Information if this scenario represents your application.

**corresponds to api method C.2.3 (Formerly D.2.2)**

**2.** Subcooled (including saturated) liquid enters PRV and flashes. No condensable vapor or noncondensable gas present.

 Example: Subcooled propane enters PRV and flashes.

Proceed to ***Method 2*** with Process Information if this scenario represents your application.

a: A noncondensable gas is a gas that is not easily condensed under normal process conditions. Common noncondensable gases include air, oxygen, nitrogen, hydrogen, carbon dioxide, carbon monoxide, and hydrogen sulfide.b: The term highly subcooled is used to reinforce that the liquid does not flash passing through the PRV.

**method 1:**  SIZING FOR TWO-PHASE FLASHING OR NONFLASHING FLOW

THROUGH A PRESSURE RELIEF VALVE.

* Saturation Temperature at PRV inlet (°R)
* Saturation Pressure at PRV inlet (psia)
* *vo=* specific volume of the two-phase system at the PRV

inlet (ft3/lb).

* *v9=* specific volume evaluated at 90% of the PRV inlet

pressure *Po* (ft3/lb)

* *Po =* pressure at the PRV inlet (psia). This is the PRV

 set pressure (psig) plus the allowable overpressure

 (psi) plus atmospheric pressure.

* *Q =* combined vapor/liquid required relieving

capacity (lb/hr).

* *Pa =* total backpressure (psia).
* *To = relieving temperature (°R ).*

# Method 2: Sizing for SUBCOOLED LIQUID AT THE PRESSURE RELIEF

# VALVE INLET

* *ρlo =* liquid density at the PRV inlet (lb/ft3).
* *ρ9 =* density evaluated at 90% of the saturation (vapor)

pressure *Ps* corresponding to the PRV inlet temperature

*To* (lb/ft3). For multi component system, use the bubble

point pressure corresponding to *To* for *Ps.*  When

determining *ρ9*, the flash calculation should be carried out

isentropically, but an insenthalpic (adiabatic) flash is

sufficient.

* *Po=* pressure at the PRV inlet (psia). This is the set

pressure (psig) plus the allowable overpressure (psi)

plus atmospheric pressure.

* *Pa =* saturation (vapor) pressure corresponding to *To* (psia).

For multi component system use the bubble point

pressure corresponding to *To.*

* *Q =* volumetric flow rate (gal/min).

* *Pa =* total backpressure (psig).
* *To =* relieving temperature (°R ).