Surface Gathering Systems

in most oil and gas production installations ,the flow from several wells will be gathered at central processing station(separators) or combined in to common pipe line. Surfaces gathering system is composed of several flow lines,main pipe line(Header),valves,and fittings.

Types of surface Gathering systems

There are two common types of Gathering systems which are:

1-Radial Gathering System

In this system, the flow line that transported the hydrocarbon from wells are jointed together at common point (Separator). This system of pipe is used in small area where the lengths of flow line are short. In this system , the flowing tubing head pressure (Ptf) of individual well(i) is summation of separator pressure (P_{sep}) plus pressure loss in flow line (ΔP_{l}), plus pressure loss through chock (ΔP_{ckock}) and pressure loss through fittings ($\Delta P_{fitting}$) as written in the following equation:

$Ptf=Psep+\Delta P_{I}+\Delta P_{ckock}+\Delta P_{fitting}$



2-Axial (Trunk line) Gathering System

In this system ,the flow lines of individual wells are tied into common pipeline called (Header),so that the pipe line flow rate is the sum of the upstream well flow rates and each well has more direct effects on its neighbors wells. This system is used for large area where the lengths of flow lines are long and with high cost.



** Selection of gathering system type will be depend on cost analysis and the topography of the region.

Flow in surface Gathering System

The flow of produced hydrocarbon fluids in surface gathering system should be laminar flow to reduce friction loss caused by friction with pipe wall(large pipe size will reduce the friction loss)

In some times slug flow of liquid and gas as sequence in pipes may occur and caused damaged of gathering system. Slug catcher tools may install in flow system to reduce slug effects.

Flow lines

Are pipe lines that transported the produced hydrocarbons from well heads to either separator or to the header line. These lines are generally of small diameter (2.5 cm to

10 cm) and made of steel or plastic welded or threaded coupling connect joints. Flow line usually are coated internally to minimize corrosion. Based on type of manufactured material, the following flow line are presented:

1- Steel pipe line 2- Fiberglass pipe line 3- Plastic pipe line 4-Asbestos pipe line

The internal pressure of flow line is determined by the well head pressure, pressure loss through chock, fitting and separator pressure. Based on the working pressure ,there are two types of flow line which are:

A-Low pressure flow line

The working pressure of this type is less than 125 psi

B-High pressure low line

The working pressure of this type is greater than 125 psi

EX! The Lignid production from three rod - pumped wells is gethered in a common Zin line . One inch Blow lines connect each well to the gathening line, and each well like contains abell Value and conventional swing check value. well sis fiel into the gathening line with standard 90 elbow, while well's 2 and 3 are connected with standard tees. The on density is 0.85 gm/cc (53.04 1bm/1+3) and viscosity of 5 up. The separator pressure is 100 psig. Assuming the relative roughness of all lines to be anool. Calculate the flowing fubing pressures of the time wells. 2000 1 Losoft Looof 55 B dh \$\$ 200 well 2 Soobld 6006/01 hell 2 800 bld No2= 1.48 @ P · Q= bbl/d. f= 1/1/17 D=in(ID), M=CP 5-0432 NR Chen Equ, > Enning hickn E= relative ronghness AP= 161/12 2F guil F= frich fretz 1= Velocity , Alser ge D = hensth, Pt 3c=32-17 91-11/161-se D=F+(ID)+ 21.25 0.9 NR L

Solution Organization Line
For S-g weat A

$$NRe = 1.48$$
 $\frac{40}{DR}$
 $= 1.48$ $\frac{40}{DR}$
 $= 1.48$ $\frac{40}{DR}$
 $= 1.48$ $\frac{40}{DR}$
 $\frac{1}{DR}$
 $= 1.48$ $\frac{40}{DR}$
 $\frac{1}{DR}$
 $= 1.48$ $\frac{40}{DR}$
 $\frac{1}{DR}$
 $= 1.48$ $\frac{40}{DR}$
 $\frac{1}{DR}$
 $= 1.48$ $\frac{40}{DR}$
 $= 1.44 - 2.41 \cdot 3$ $(E + \frac{21.25}{NR^2})$
 $= 1.44 - 2.613$ $(E - \frac{21.25}{NR^2})$
 $= 1.48$ $(E - \frac{21.25}{NR^2})$
 $= 1.48$ $(E - \frac{21.25}{NR^2})$
 $= 2.64.614$
 $= 2.65$ H

$$\frac{51}{1- Gatharis Line}$$

$$\frac{52}{1- Gatharis Line}$$

$$\frac{5-3}{A} \frac{G(Lb)L(d)}{S=0} \frac{NR}{3930} \frac{F}{0.003} \frac{U(H/se)}{1.49} \frac{DP}{3} \frac{P}{1.49} \frac{P}{3} \frac{P}{1.49} \frac{P}{1.49}$$

		in the second				1.	Store in			
								6454		
		Descent of the second sec								
	Henry									
	; j.					· · · ·				
			Table 10-1							
			lable 10-1					· .		
			Equivalent L	engths of Valves and	Fittings ^a .					•
					Description of Car		Equivalent Length			
					Description of Holing		in Pipe Diameters		1	
			Globe	Stem perpendic- ular to run	With no obstruction in flat, heyel, or	To live and	210	· · · ·		
					With wing or pin guided disk	Fully open	450			
				Y-pattern	(No obstruction in flat, bevel, or					
					-With stern (C' from run of					
					pipe line	Fully open	175			
					pipe line	Fully open	145			
			Angle valves		With no obstruction in flat, bevel, or					
	Production of the second	20			plug type seat With wine or nic second dist	Fully open	145			
		7	Gate	Wedge, disk	was a mil or han-Banaco case	Fully open	13			
			values	Double disk	× .	Three-quarters open	35 -			
	10- S.			on head orex		One-quarter open	160 960			
				Pulp stock	S. Com	Fully open	17			
						Three-quarters open One-half onen	50 260			
						One-quarter open	1200			
			Conduit pipe list	e gate, ball, and plug values		Fully open	3			
			valves	Conventional swing Clearway swing		Fully open Fully open	135		•	
				Globe life or stop; stem	perpendicular to run or	, and along				
				Y-pattern Angle lift or stop		Fully open	Same as globe			
				Same as angle			ruay open			
			-	In-line ball		Fully open	150			
			, Table 10-1 (Cor	ntrued)						
			Table 10-1 (Cor	ntinued) engliss of Valves and	Fittings					
			Table 10-1 (Cor Equivalent L	ntinued) engthe of Valves and	Fittings®					
			Table 10-1 (Co Equivalent L	ntimuso) engths of Valves and	Fittings ^a Description of Fitting		Equivalent Length in Pipe Diamotors			
			Table 10-1 (Cor Equivalent L Poot valves with	ntinued) engths of Valves and stnitter	Fittings® Description of Fitting With pages His-type data	Fully open	Equivalent Length in Pipe Diamotors 430			
			Table 10-1 (Con Equivalent L Poot valves with Butterfly valves (ntinused) engths of Valves and stniner (8 m. and larget)	Fittings® Description of Fating With paynet Bill-type dick With traiter-tringed dick	Fully open Fully open Fully open Fully open	Equivalent Length in Pipe Diamotars 420 75 40			
			Table 10-1 (Cor Equivalent L Foot taives with Butterly valves (Clocks	ntmaed) engths of Valves and sminer (8 in. ad larger) Straight-drough	Fittings ⁸ Description of Fitting With paynet filt-type dick With traiter-kinged disk Rectarguing risks poor area equal to	Fully open Fully open Fully open Fully open Fully open	Equivalent Length in Pipe Diamotars 420 75 40 18			
			Table 10-1 (Cor Equivalent L Foot salves with Butterfly valves I Cocks	ntinued) engths of Valves and strainer (8 m. ad larger) Straight-drough Three-way	Fittings ⁸ Description of Fitting With papper till-type disk With kather-hinged disk Rectagelist pileg post sere equal to 2005 of pipe seas.	Filly open Filly open Filly open Filly open Filly open Filly open Filly open	Equivalert Length in Pipe Diamotors 420 75 40 18 18			
		225	Table 10-1 (Cor Equivalent L Foot valves with Butterfly valves 1 Cocks	ntinuad) engths of Valves and strainter (8 m. and larger) Straigh-through Three-way	Fittings ⁴ Description of Fiting With paper bit-type disk With leafter-biaged disk Rectangular plag post zero equal to 2005 of pipe zero equal to 505 of pipe zero.	Fully open Fully open Fully open Fully open Fully open Forw straight through Flow forced branch	Econvalert Length in Pipe Diamotars 420 75 40 18 44 140			
		225	Table 10-1 (Cod Equivalent L Foot salves with Butterfly valves (Cods	ntinuad) engths of Valves and strainter (8 m. ad larger) Straigte-drough Three-way 90' standard alters	Fittings ⁴ Description of Fiting With payee Bit-type dric With harder-bill-goed dric With harder-bill-goed dric With harder-bill-goed dric Rectagging the goed area Rectagging the goed area (Fully open)	Fully open Fully open Fully open Fully open Fully open Flow straight through Flow straight through Flow straight branch	Equivalent Length in Pipe Diamotors 420 75 40 18 44 140 20			
		225	Table 10-1 (Cor Equivalent L Foot subres with Butterfly values (Cocks Fittings	ntinued) engths of Valves and stnitter (8 m. ad larger) Straight-drough Thure-way 90-standard ellow 45° standard ellow	Fittings® Description of Filling With papers fil-type dis With batter Alaped disk Restragister plag post area Restragister plag post area Restragister plag post area Restragister plag post area (july open)	Fully open Fully open Fully open Fully open Fully open Fully open Fully open Fully open	Equivalent Length in Pipe Diameters 420 75 49 18 44 140 30 15			
		225	Table 10-1 (Co Equivalent L Foot suites with Batterily values (Codia Fittings	ntinued) engths of Valves and stniner (8 m. and larget) Straight-through Three-way 90° standard elbox 90° long radius elbox 90° long radius elbox 90° staret abox	Fittings® Description of Fitting With papers Bit-type dick With traiter-shaped dick Recturgular plag port area qual to 80% of pipe area	Fully open Fully open Fully open Fully open Fully open Fully open Flow through branch	- Equivalent Length in Pipe Diamotors 420 73 49 18 44 140 30 16 20			
		225	Table 10-1 (Co Equivalent L Foot sulves with Botterily valves (Cocks Fittings	ntinued) engths of Valves and stnitter (8 m. and larger) Straigde-through Three-way 30° standard ofton 90° long radius chow 90° statest albow 45° statest chow	Fittings® Description of Fitting With paynet filt-type disk With hastne-skinged disk Rectruptur plag post area equal to X00% of type area. Accurgular plag post area equal to 80% of type area (fully open)	Fully opn Fully opn Fully opn Fully opn Fully opn Fully opn Flow through transh	Equivalent Length in Pipe Diamotors 420 75 49 18 44 140 30 16 20 50 50 52			
		225	Table 10-1 (Co Equivalent L Foot sulves with Butterfly valves (Cicks Fittings	ntinued) engths of Valves and stainer (8 in. and larget) Straight-through Thure-way 90° standard elbow 45° standard elbow 90° long radius elbow 90° long radius elbow 90° long radius elbow 90° long radius elbow 90° standard elbow 90° long radius elbow 90° long radius elbow	Fittings ⁸ Description of Fitting With paynet fitt-type disk With teature-kinged disk. Rectagalar plag poot area equal to 2005 of pipe area equal to 50% of pipe area equal to 50% of pipe area (fully open)	Fully open Fully open Fully open Fully open Fully open Flow straight damagin Flow damagih branch	Equivalent Length in Pipe Diamotors 420 75 40 18 44 140 30 16 20 50 50 50 50 57			
		225	Table 10-1 (Cor Equit/valent L Foot subres with Butterly valves i Cickis Fittings	ntinuad) engths of Valves and strainter (8 in. ad larger) Straigit-drough Three-way 30° standard elbox 45° standard elbox 90° long radia elbox	Fittings ⁴ Description of Fiting With papper till-type disk With leather-binged disk Rectangular pilog post area equal to 2005 of pipe area Rectangular pilog post area equal to 5056 of pipe area (fully open) With flow strongth run With flow strongth run With flow strongth run	Filly open Felly open Felly open Felly open Felly open Flow through through Flow decough through	Equivalent Length in Pipe Diamotons 420 75 40 18 44 140 30 16 20 20 20 20 20 20 20 20 20 20 20 20 20			
		225	Table 10-1 (Coc Equivalent L Poot salves with Butterfly valves (Cocks Fittings	ntinued) engths of Valves and stainter (8 m. ad larger) Straight-drough Three-way 90 standard offew 459 standard offew 459 staret clows 99 staret clows 99 staret clows Standard tee Coot-patter relaxy	Fittings ⁴ Description of Fiting With paper fit-type disk With barber Aligned disk Rectangular plag port area equal to 2005 of pipe area Rectangular plag port area equal to 300 of pipe area (fidly open) With flow through naw	Fully open Fully open Fully open Fully open Fully open Fully open Fully open Fully open	Equivalent Length in Pipe Diamoters 420 75 420 18 44 140 18 44 140 30 16 20 20 26 57 20 60 50			
		225	Table 10-1 (Cor Equivalent L Root valres with Butterfly valres (Cocks Fittings	ntinued) engths of Valves and stnitter (8 m. ad larger) Straight-drough Thure-way 90° standard ellow 45° sta	Fittings® Description of Filling With paper Bil-type dis With barbor Alagod disk Rectarging Palag port area equal to 2005 of pipe area required to the second second second second citized on the second second second second (idly open)	Fully open Fully open Fully open Fully open Fully open Fully open Fully open	Equivalent Length in Pipe Diameters 420 75 49 18 44 140 30 16 20 50 26 50 26 57 20 60 59			
		225	Table 10-1 (Cor Equivalent L Root valves with Butterfly valves (Cocks Fittings	ntinued) engths of Valves and stnitter (8 m. ad larget) Straight-drough Thure-way 90 standard show 90 standard show 90 standard 45 standard show 90 stand sh	Fittings* Description of Fitting With papers Bit-type dis With bank-shaped das Rectupping page port area epaal to 2005 of pipe area epail to 50% of pipe area epail to 50% of pipe area (July open) With flow through na With flow through na	Fully open Fully open Fully Fully open Fully Fully open Fully Fully open Fully F	Equivalent Langth in Pipe Diamotors 420 75 49 18 44 140 30 16 20 50 26 57 50 60 50			
		225	Table 10-1 (Co Equivalent L Foot salves with Butterfly valves (Cocks Fittings	ntinuso) engths of Valves and stniner (8 m. and larger) Straight-drough Three-way 90° standard elbox 45° stored telbox 45° stor	Fittings* Description of Fitting With popper Bill-type disk With trainer-staged disk Recturging traing oper stare qual to 50% of pipe area (edge open) With flow drength train With flow drength train With flow drength train	Fully open Fully open Fully open Fully open Fully agen Flow through branch	Equivalent Length in Pipe Diamotors 420 75 40 18 44 140 30 16 20 50 50 50 50			
		225	Table 10-1 (Co Equivalent L Foot suffees with Buttedly values (Cocks Fittings Fittings	ntinued) engths of Valves and statister (8 n. and Imper) Straight-through Three-way 90° standard elbox 45° storet doos 90° log radia elbox 90° log	Fittings* Description of Fitting With paynet filt-type dick With trainer-tanged dick Rectangular plag post area equal to X0% of pipe area equal to 50% of pipe area equal to 50% of pipe area (fully open) With flow through that With flow through that.	Fully open Fully open Fully open Fully open Fully open Flow forcegh branch	Equivalent Length in Pipe Diamotors 420 75 40 18 44 140 30 16 20 50 50 50 50			
		225	Table 19-1 (Cor Equivalent L Foot subres with Butterly values I Cocks Fittings	ntinued) engths of Valves and stainter (8 in. ad larger) Straigit-drough Three-way 30° standard often 45° tandard often 45° standard often 90° long radia was 90° lon	Fittings ⁴ Description of Fiting With payer Bit-type dis With bayer bit-type dis With bayer bit-type dis With type dis Rectagging the goat area equal to Disol of pipe area (fully open) With flow through naw With flow through naw	Fully open Fully open	Equivalent Length in Pipe Diamotors 420 75 40 18 44 140 30 16 20 50 26 57 50 26 57 50 26 50 50 50			
		225	Table 10-1 (Coc Equivalent L Poot taives with Butterfly valves (Cocks Fittings	ntinued) engths of Valves and stainter (8 in. ad larger) Straigle-drough Three-way 90 ⁻ standard ellow 45 ⁺ statet abox 90 ⁺ statet abox 90 ⁺ statet abox 90 ⁺ statet abox Standard tee Clois-pattern return ben 5.	Fittings® Description of Filling With paper Bil-type dix With barber Alaped disk Rectaspitor pilog port area Recurspitor pilog port area qualito 50% of pipe area (fully open) With flow through ram With flow through hearch	Pully open Pully open Pully open Fully open Fully open Pully denugh Pully denugh Pully denugh Pully denugh Pully denugh Pully open	Equivalent Length in Pipe Diameters 420 75 49 18 44 140 30 16 20 50 26 50 26 57 20 60 50			
		225	Table 10-1 (Cor Equivalent L Root valves with Butterfly valves (Cocks Fittings	ntinued) engths of Valves and similar (8 m. ad larger) Straight-drough Thure-way 90° tong radius ellow 90° ton	Fittings* Description of Fitting With papers fit-type dis With papers fit-type dis With bank-shaped dus Rectupping page area equal to 50% of pipe area equal to 50% of pipe area (Taby open) With flow through ran With flow through hench	Fully open Fully open Fully Fully open Fully Fully open Fully Fully open Fully Fully open Fully Ful	Equivalent Langth in Pipe Diamotors 420 75 49 18 44 140 30 16 20 50 26 57 20 60 50			
		225	Table 10-1 (Cot Equivalent L Foot subres with Butterfly values (Codia Fittings	ntinued) engths of Valves and stniner (8 m. aol larget) Straigh-drough Three-way 90° standad elbox 90° large addor 90° stated abox 90° stated abox 100°	Fittings* Description of Fitting With paynet Bill-type dick With Latter-shaped dick Recturgular plag port area qual to 80% of pipe area qual to 80% of pipe area qual to 80% of pipe area (fully open)	Fully open Fully open Fully open Fully open Fully open Flow straight through Flow straight through	Equivalent Length in Pipe Diamotors 420 73 44 140 30 16 20 50 50 50			
		225	Table 10-1 (Co Equivalent L Foot sulves with Butterfly valves (Cocks Fittings	ntinuad) engths of Valves and stnitter (8 n. and Intger) Straight-through Three-way 90° standard elbox 45° storet doow 90° long radia elbox 90° long radia e	Fittings* Description of Fitting With popper fitt-type disk With traine-schaped disk Rectrapting plag port area cpail to 80% of pipe area (ridly open) With flow through train With flow through train With flow through train	Fully opna Fully opna Fully opna Fully opna Fully opna Fully opna Flow through transfe	Equivalent Length in Pipe Diamotors 420 75 49 18 44 140 30 16 20 50 50 50 50			
		225	Table 10-1 (Cor Equitivalent L Poot salves with Butterly valves (Cocks Fittings	ntinuad) engths of Valves and stainter (8 in. ad larger) Straigit-drough Three-way 30° standard ofton 45° standard ofton 90° long radia	Fittings ⁴ Description of Fiting With payer Bit-type dis With barber bit-type dis With barber bill-good disk Rectanguing bills good zeros equal to Diolo of pipe area (fully open) With flow through ram With flow through tranch	Fulty open Fulty open Fulty open Fulty open Fulty open Fulty open Flow straight through Flow through tranch	Equivalent Length in Pipe Diamotors 420 75 40 18 44 140 30 16 20 50 26 57 20 60 50			

Г