

OIL & GAS PRODUCTION & TREATMENT TECHNOLOGIES



SEP-Calc™ Software

Rev	Description	By	Check	Appd	Date
1	Initial Issue	abc			10/23/19
2					
3					
4					

KIRK Process Solutions
Process Calculation Sheet

KO-Calc Liquid Mist Droplet Carryover Calculator

Project Name:
 Customer:
 Vessel Name:
 Tag No:

Case	A	B	C
Target Droplet Diameter d, Micron	500	300	200
Gas Flowrate, M_g , kg/h	10,000	50,000	100,000
Gas Density, ρ_g , kg/m ³	15.00	25.00	35.00
Gas Viscosity, μ , cP	0.011	0.012	0.013
Liquid Density, ρ_l , kg/m ³	800.00	750.00	650.00
Gas X-S Area, A_g , m ²	0.97	1.30	2.00
Gas Flowrate, Q_g , m ³ /s	0.19	0.56	0.56
Droplet Terminal Velocity, U_t , m/s	0.19	0.43	0.28
Droplet Reynolds No (1+Re^{1.000}), Re	26	268	277
Droplet Drag Coefficient, C	1.84	0.61	0.61
Required Vessel Dia (min. ID), mm	1108	1284	1597

Notes

1)	
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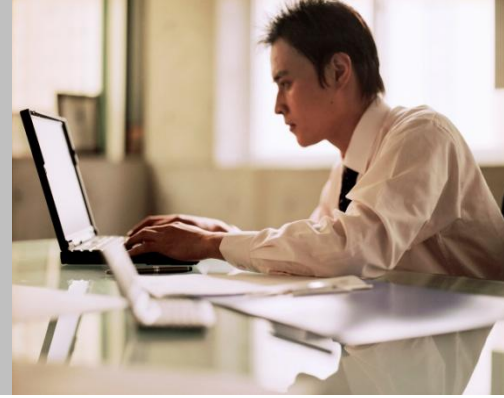
Document Title: Carryover Calculations for Vertical KO Drum	Document No: ABC-12345
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Sheet 1 of 1



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ENABLING YOU TO PERFORM A WIDE RANGE OF OIL & GAS SEPARATION TASKS



Sep-Calc™ Software Modules

Using our proprietary **Sep-Calc™** software, you can simulate the client's operating cases in a variety of separator arrangements to optimise the design concept, vessel size and internal components to meet the target performance characteristics.

Each module has been designed to be a simple, everyday tool for Process Engineers on a stand-alone basis. For this reason we provide the programs in MS-Excel format where the design outputs can be easily printed or saved to electronic pdf format.

To encourage the use of the Sep-Calc suite of programs within your organisation there are no complex dongles, security codes or passwords and the License is per Client Site with unlimited users. However, these are licensed products and not free-ware or share-ware and Clients must ensure under the License Terms that the software is securely retained for use in their own organisation only.

Much of the design code is viewable as part of a design audit trail if required.

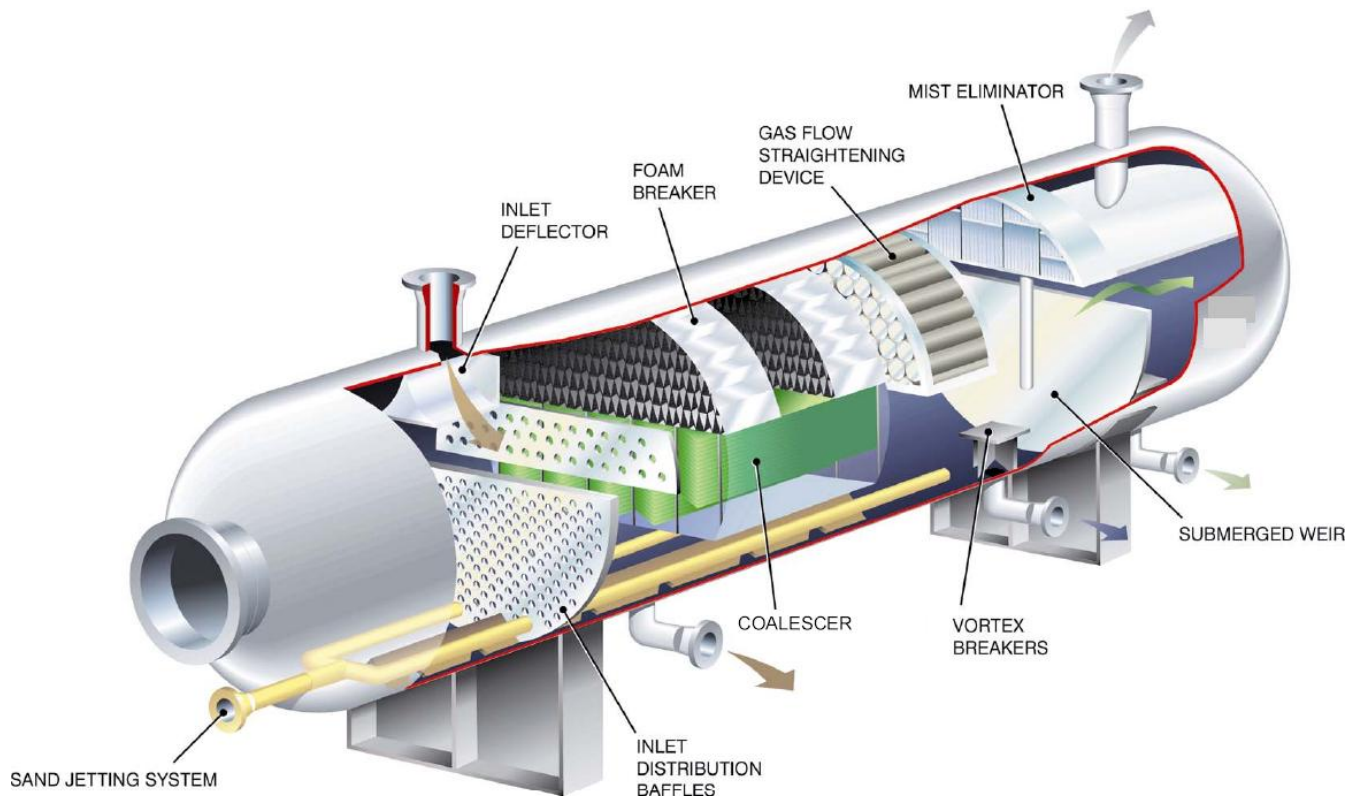
Title	Description
XSA-Calc	Calculates full and partial/segment vessel cross sectional areas.
XSV-Calc	Calculates full and partial vessel volumes for horizontal and vertical vessels.
RT-Calc	Calculates multi-level liquid volumes and residence times in horizontal and vertical vessels.
ME-Calc	Mist eliminator sizing estimation for typical mesh, vane and axial cyclone products.
XID-Calc	Sizing and selection of suitable inlet distributor for vertical and horizontal vessels.
KO-Calc	Liquid in gas droplet carryover calculator for horizontal and vertical vessels e.g. flare KO drums.
HSep-Calc	Basic horizontal gas/liquid separator sizing with nozzle velocities, pressure drops, level alarm settings, residence times, 2/3 phase options, demister sizing.
VSep-Calc	Basic vertical gas/liquid separator sizing with nozzle velocities, pressure drops, level alarm settings, residence times, 2/3 phase options, demister sizing.
HSep-Calc+	Advanced horizontal gas/liquid separator sizing with Basic features plus performance checks for carryover in each phase.
SJ-Calc	Design of fluidized-bed sand jet system and calculation of required headers and nozzles.
PP-Calc	Sizing of plate coalescing pack for liquid/liquid separation enhancement.

For complex designs or for applications requiring specialist internals we also offer a bespoke design consulting service.

CUSTOMISE DESIGNS TO DELIVER OPTIMUM SOLUTIONS



A TYPICAL PRODUCTION SEPARATOR for oilfield service is illustrated below, but the selection and optimisation of the appropriate technology is determined on a case by case basis.



INLET DEVICES

Half-Pipe
Bifurcator
Tangential
Splash Plate
Multi-Vane
Schoepentoeter
Cyclone

FOAM BREAKERS

Serpentine Packs
Mesh Pads
Structured Packs
Cyclones
Angled Plates
Flow Straighteners

MIST ELIMINATORS

Mesh Demisters
Plain Vane Packs
Pocketed Vanes
Combination Packs
High Surface Packing
Axial Cyclones
Gas Domes

DISTRIBUTORS

Perforated Baffles
Slotted Baffles
Pipe Distributors
Troughs
Wave Breakers
Gas Outlets

COALESCER PACKS

Mesh Pads
Dual Media Mesh
Corrugated Plates
Matrix Packs
Plate Packs
Liquid Boots

OTHER INTERNALS

Vortex Breakers
Submerged Weirs
Overflow Weirs
Oil Buckets
Sand Jet Systems
Sand Pans
Ant-Motion (FPSO)

PROCESS DESIGN EXPERTISE CAN BE CAPTURED AND CONTINUALLY IMPROVED



Example program page

Rev	Description	By	Chkd	Appd	Date
0	First Issue	ABC			10/10/20
1					
2					
3					
4					

Company Name

Process Calculation Sheet

Sep-Calc Plus Separator Performance Calculator

Project Name: TBA
 Customer: Gas Tech India
 Vessel Name: LP Separator
 Tag No: V-Q1-A/B ID, mm: 2,500 T/T, mm: 10,000

2 or 3 Phase Operation: 3

	Case 1			Case 2		
	°C	Bar(g)	22.00	°C	Bar(g)	12.00
Operating Temp/Press	45.0	Bar(g)	22.00	22.0	Bar(g)	12.00
Bulk Fluid Description	Gas	Oil	Water	Gas	Oil	Water
Normal Liquid Levels	N/A	1,400	300	N/A	1,400	750
Fluid Flowrate	kg/h	40,000	150,000	12,500	25,000	60,000
Fluid Density	kg/m ³	15.00	850.0	990.0	5.00	800.0
Fluid Viscosity	cP	0.010	2.00	1.00	0.012	1.00
Gas MW		18.00	N/A	N/A	22.00	N/A
Liquid Surface Tension		N/A	20.0	60.0	N/A	15.0
Actual Flowrate	m ³ /h	2666.7	176.5	12.5	4166.7	75.0
Standard Flowrate	Nm ³ /h	49,800.0	N/A	N/A	25,465.9	N/A
Calc. Residence Time	min	44.58	25.85 [*]	1.907	22.80	11.329
Calc. Droplet Removal ¹	Microns	8.1	11.4		8.2	14.7
Calc. Carryover ²	% Vol	278	76		84	80
		4.04	0.018		1.23	0.008

* Without coalescer pack

Vessel Layout & Internals

Nozzle Data	ID, mm	Vel, m/s	pv ² , Pa	Vel, m/s	pv ² , Pa
N1 Feed Inlet	300	11.2	8,021	16.8	8,258
N2 Gas Outlet	250	15.1	3,418	23.8	5,336
N3 Oil Outlet	200	1.8	2,069	0.7	352
N4 Water Outlet	100	0.4	197	1.3	1,819

Notes:
 1)
 2)
 3)

Document Title: **Design Summary Sheet for Horizontal Separator** Document No. _____ Sheet: 3 of 3

Editable headers and footers show your own company name or logo and track revisions

Simple and clear data entry fields transmit design criteria across all calculation sheets for 2-4 cases

Key calculation outputs are highlighted on the summary sheet to assist the designer

Multiple choice selection of various internals types permits rapid optimization of sizing

Additional key data is shown on the summary page with further more detailed data on subsequent pages

For current pricing and further information see our website or contact

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The designs presented using Sep-Calc software are not, except where specifically stated otherwise, based on any international design codes or recommended practices, or any operator or engineering company's standards. Rather, they represent, in our opinion, good process engineering practice and as such all design outputs should be checked and verified for any particular application by the customers own qualified personnel.

Save as to certain trademarked products, the designs of named internals also are not based on any specific manufacturer's rules or guidelines and should be independently checked by the selected supplier prior to manufacture.

Many of the design factors and variables used in the Sep-Calc programs may be modified or adapted by the customer to suit his own range of products or view of design methods and margins. This flexibility also allows customization of product names and models used for many internals.