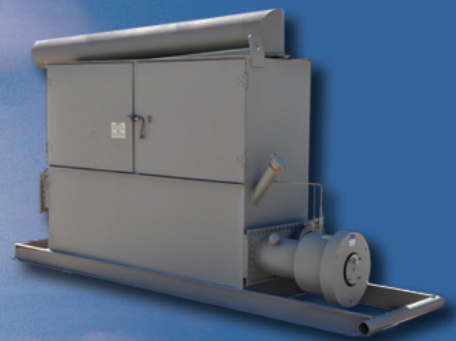
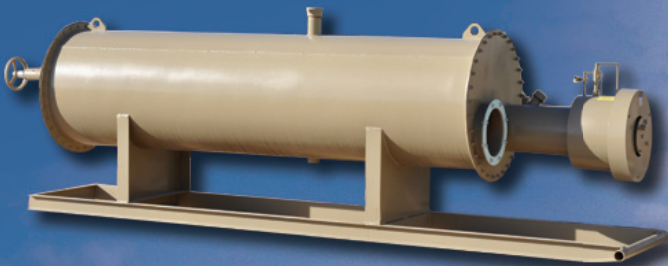


PROCESS EQUIPMENT

Permian Fabrication and Service™



PROCESS EQUIPMENT

National Oilwell Varco® offers Permian Fabrication and Service process equipment through Mission™ Products.

Separators

NOV® offers ASME code and non-code horizontal and vertical separators that can be customized in a variety of units:

- HLP Units
- BC-HLP Units (patented)
- Cabin Units
- Testing packages



Horizontal Separator

Low Pressure Horizontal Separators — Capacities and Weights

Size		WP PSIG	Two-Phase				Three-Phase			
Outer Dia.	Length		Approx. Weight, Lbs.	Liq. Cap. (bbl/day)	Gas Cap., MMSCFD		Approx. Weight, Lbs.	Liq. Cap. (bbl/day)	Gas Cap., MMSCFD	
					50 PSIG	100 PSIG			50 PSIG	100 PSIG
24"	5' - 0"	125	800	1125	3.4	4.6	-	-	-	-
24"	6' - 0"	125	-	-	-	-	1100	420	2.4	3.2
24"	10' - 0"	125	1100	2250	4.3	5.8	1400	830	3.0	4.1
30"	10' - 0"	125	1400	3350	6.8	9.2	1700	1310	4.7	6.4
36"	10' - 0"	125	1700	5120	9.7	13.2	2000	1890	6.8	9.2
42"	10' - 0"	125	2400	7000	13.3	18.0	2700	2590	9.3	12.6
48"	10' - 0"	125	3200	9200	17.4	23.5	3500	3400	12.1	16.4
48"	15' - 0"	125	4100	13800	21.3	28.8	4400	6520	14.8	20.1
54"	10' - 0"	125	3900	11700	22.4	30.2	4100	4320	15.6	21.1
54"	15' - 0"	125	4900	17500	27.4	37.0	5200	8270	19.2	25.9
60"	10' - 0"	125	5000	14500	32.1	43.4	5300	5350	22.4	30.3
60"	15' - 0"	125	6300	21700	35.9	48.5	6700	10250	25.2	34.0

Note: Capacities are based on 45° API liquid, 1 minute retention time for two-phase, 3 minute retention time for three-phase, and 0.70 specific gravity gas.

High Pressure Horizontal Separators — Capacities and Weights

Size		WP PSIG	Approx. Weight (lbs)	Two-Phase							Three-Phase						
Outer Dia.	Length			Liq. Cap. (bbl/day)	Gas Capacity MMSCFD						Liq. Cap. (bbl/day)	Gas Capacity MMSCFD					
					400 PSIG	600 PSIG	800 PSIG	1000 PSIG	1200 PSIG	1440 PSIG		400 PSIG	600 PSIG	800 PSIG	1000 PSIG	1200 PSIG	1440 PSIG
12"	7'-6"	1100	695	391	3.5	4.3	5.0	5.6	-	-	183	2.3	2.8	3.3	3.7	-	-
		1440	857	360	3.3	4.1	4.7	5.3	5.8	6.4	173	2.2	2.7	3.1	3.5	3.8	4.1
12"	10'-0"	1100	864	504	4.0	4.9	5.7	6.4	-	-	263	2.6	3.2	3.8	4.2	-	-
		1440	1074	464	3.8	4.7	5.5	6.2	6.7	7.4	249	2.5	3.1	3.6	4	4.4	4.8
16"	7'-6"	1100	1078	762	5.1	6.3	7.3	8.2	-	-	293	3.6	4.4	5.1	5.7	-	-
		1440	1338	706	4.9	6.0	7.0	7.8	8.6	9.4	277	3.4	4.2	4.9	5.4	6.0	6.5
16"	10'-0"	1100	1344	979	5.9	7.3	8.4	9.5	-	-	419	4.1	5.1	5.9	6.6	-	-
		1440	1680	908	5.6	6.9	8.1	9.0	9.9	10.8	396	3.9	4.8	5.6	6.3	6.9	7.5
20"	7'-6"	1100	1677	1391	7.5	9.3	10.7	12.1	-	-	466	5.6	6.9	8	9	-	-
		1440	2094	1297	7.2	8.8	10.3	11.5	12.6	13.8	440	5.3	6.5	7.6	8.5	9.3	10.2
20"	10'-0"	1100	2093	1779	8.7	10.7	12.4	13.9	-	-	662	6.5	8	9.2	10.4	-	-
		1440	2628	1659	8.3	10.2	11.8	13.3	14.6	15.9	627	6.1	7.5	8.8	9.8	10.8	11.8
24"	7'-6"	1100	2426	2221	10.4	12.8	14.8	16.6	-	-	682	8.1	9.9	11.5	12.9	-	-
		1440	3042	2076	9.9	12.2	14.1	15.9	17.4	19.0	645	7.6	9.4	10.9	12.3	13.4	14.7
24"	10'-0"	1100	3026	2828	12.0	14.7	17.1	19.2	-	-	965	9.3	11.5	13.3	14.9	-	-
		1440	3810	2645	11.4	14.1	16.3	18.3	20.1	21.9	913	8.8	10.9	12.6	14.2	15.5	16.9

Note: Capacities are based on 45° API liquid, 1 minute retention time for two-phase, 3 minute retention time for three-phase, and 0.70 specific gravity gas.



Vertical Separator



Cabin Unit

Low Pressure Vertical Separators — Capacities and Weights

Size		Nom. WP PSIG	Approx. Weight 2-PH (lbs)	Approx. Weight 3-PH (lbs)	Liquid Capacity		Gas Capacity MMSCFD		
Outer Diameter (inches)	Length (feet)				2-PH (bbl/day)	3-PH (bbl/day)	50 PSIG	100 PSIG	125 PSIG
24"	5'	125	400	450	1012	592	2.8	3.8	4.2
24"	10'	125	1002	1053	1930	1163	2.8	3.8	4.2
30"	10'	125	1253	1303	3041	1817	4.4	5.9	6.5
30"	15'	125	1653	1703	4866	2743	4.4	5.9	6.5
36"	10'	125	1529	1279	4405	2617	6.3	8.5	9.4
36"	15'	125	2008	2058	7048	3950	6.3	8.5	9.4
42"	10'	125	1822	1872	6019	3562	8.6	11.6	12.8
42"	15'	125	2383	2433	9631	5377	8.6	11.6	12.8
48"	10'	125	2147	2197	7886	4652	11.3	15.1	16.7
48"	15'	125	2788	2838	12618	7023	11.3	15.1	16.7
54"	10'	125	2452	2502	10004	5888	14.3	19.1	21.1
54"	15'	125	3047	3097	16007	8888	14.3	19.1	21.1
60"	10'	125	2814	2864	12374	7270	17.6	23.6	26.1
60"	15'	125	3615	3665	19799	10973	17.6	23.6	26.1

Note: Capacities are based on 45° API liquid, 1 minute retention time for two-phase, 3 minute retention time for three-phase, and 0.70 specific gravity gas.

High Pressure Vertical Separators — Capacities and Weights

Size		Nom. WP PSIG	Approx. Weight (lbs)	Liquid Capacity		Gas Capacity MMSCFD					
Outer Diameter (inches)	Length (ft. - in.)			2-PH B/D	3-PH B/D	400 PSIG	600 PSIG	800 PSIG	1000 PSIG	1200 PSIG	1440 PSIG
12"	5'-0"	1100	526	191	-	1.8	2.2	2.6	2.9	-	-
12"	5'-0"	1440	640	181	-	1.7	2.1	2.4	2.7	3.0	3.2
12"	7'-6"	1100	695	335	202	1.8	2.2	2.6	2.9	-	-
12"	7'-6"	1440	857	318	191	1.7	2.1	2.4	2.7	3.0	3.2
16"	5'-0"	1100	811	302	-	2.8	3.5	4.0	4.5	-	-
16"	5'-0"	1440	997	286	-	2.7	3.3	3.8	4.3	4.7	5.1
16"	7'-6"	1100	1078	528	318	2.8	3.5	4.0	4.5	-	-
16"	7'-6"	1440	1338	501	302	2.7	3.3	3.8	4.3	4.7	5.1
20"	5'-0"	1100	1260	471	-	4.4	5.4	6.3	7.1	-	-
20"	5'-0"	1440	1561	447	-	4.2	5.1	6.0	6.7	7.3	8.0
20"	7'-6"	1100	1677	825	498	4.4	5.4	6.3	7.1	-	-
20"	7'-6"	1440	2094	782	472	4.2	5.1	6.0	6.7	7.3	8.0
24"	10'-0"	1100	3026	1698	1000	6.3	7.8	9.1	10.2	-	-
24"	10'-0"	1440	3810	1610	948	6.0	7.4	8.6	9.6	10.5	11.5
30"	10'-0"	1100	4788	2654	1563	9.9	12.2	14.1	15.9	-	-
30"	10'-0"	1440	6048	2516	1481	9.4	11.5	13.4	15.0	16.5	18.0

Note: Capacities are based on 45° API liquid, 1 minute retention time for two-phase, 3 minute retention time for three-phase, and 0.70 specific gravity gas.

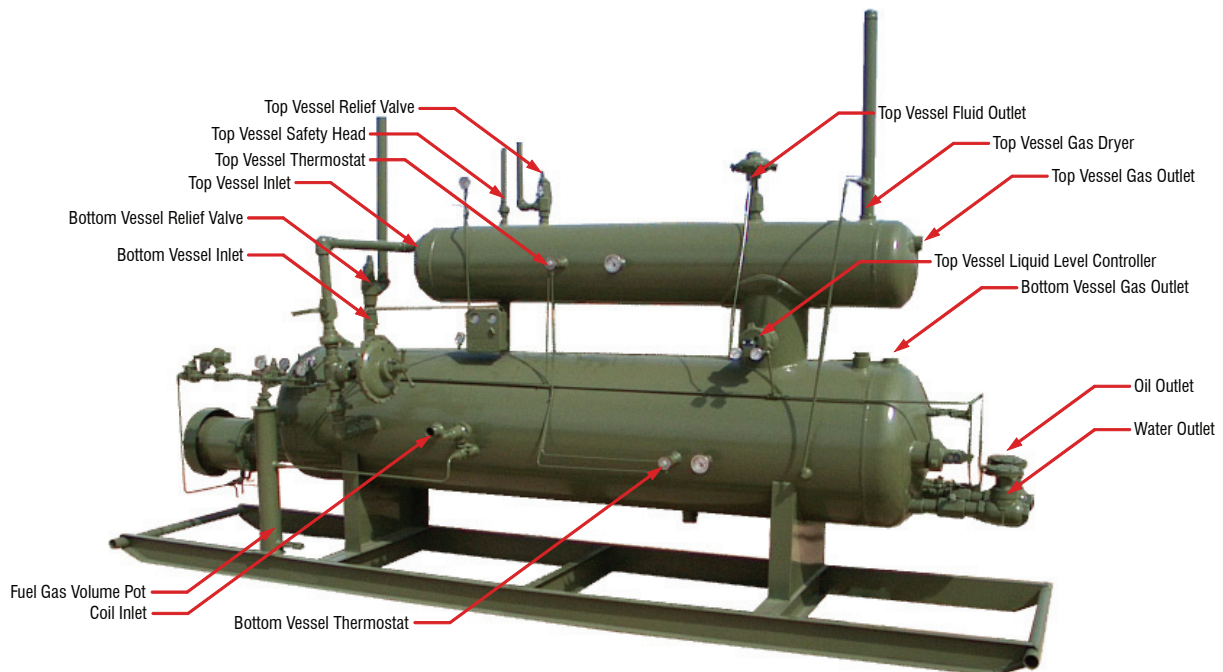
PROCESS EQUIPMENT

HLP Unit

The HLP Unit is a two-stage separator-treater production unit that has a high pressure, two-phase separator installed on top of a low pressure, three-phase separator with a firetube. It is used to heat oil and water for better separation.

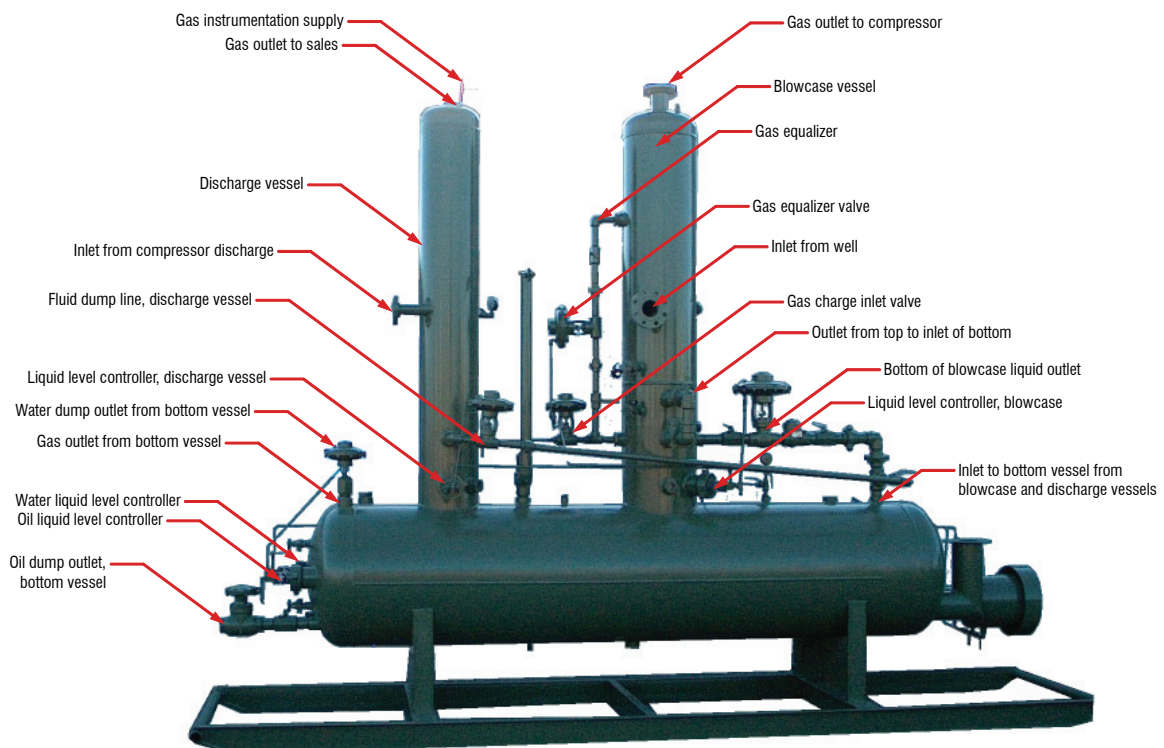
This unit is designed for wells that:

- Have high shut in pressure
- Produce into a high pressure gas sales line
- Have moderate gas volume
- Have moderate liquid volumes
- Need heat to separate water and oil



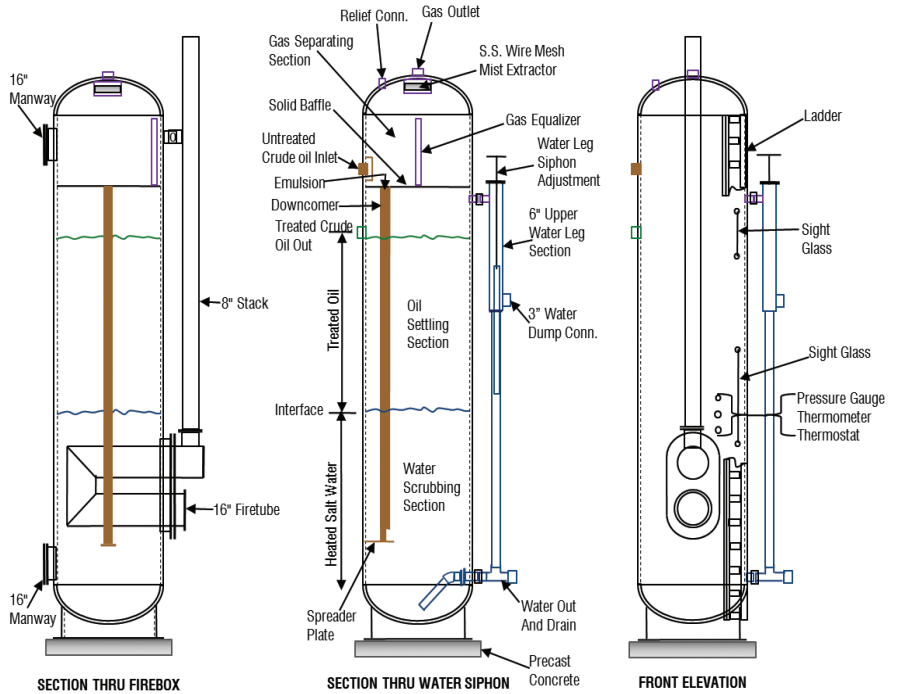
BC-HLP Unit

The patented BC-HLP Unit offers a small footprint and reduced energy consumption by combining a blowcase vessel, a discharge vessel, and a three-phase separator in one unit. For wells with low bottom hole pressure, such as coal bed methane, this unit can be operated at near 0 PSI, which enables higher flow rates from well, more revenue to operator.



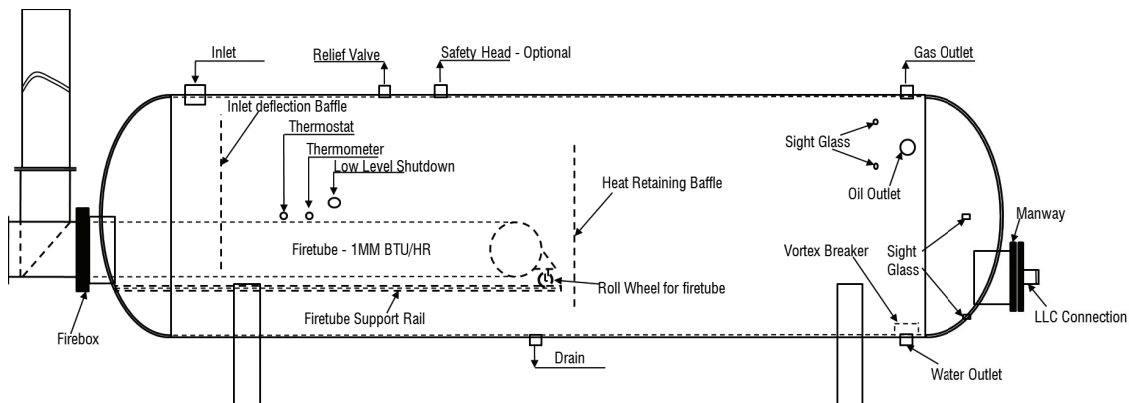
Vertical Heater Treaters

DIAMETER x HEIGHT, ft	4' x 20'	6' x 20'	8' x 20'	10' x 20'
Working pressure, PSI	50 or 75	50 or 75	50 or 75	50 or 75
Oil treating capacity, bbl/day	100 - 500	200 - 1000	500 - 1600	800 - 2750
Gas capacity, MMCFD	1 - 2	2 - 4	3 - 6	5 - 9
Fire box capacity, BTU/HR	360,000	500,000	1,000,000	1,300,000
Fire box area, sq. ft.	36	52	100	126.7
Fire tube size	16"	16"	24"	24"
Stack size	8"	8"	16"	16"
Settling section volume, bbl	19	43	72	112
Total oil and water volume, bbl	34.2	80.3	143	224
Inlet size	3"	3"	4"	4"
Oil outlet size	3"	3"	4"	4"
Water outlet size	3"	3"	4"	4"
Gas outlet size	3"	3"	4"	4"
Drain size (Siphon Type)	3"	3"	3"	3"
Water leg weir	3"	3"	3"	4"
Relief valve size	2"	2"	2"	2"
No. of 16" manways	2	2	2	2
Shipping weight, lbs	6,000	8,500	11,500	15,750



Horizontal Heater Treaters

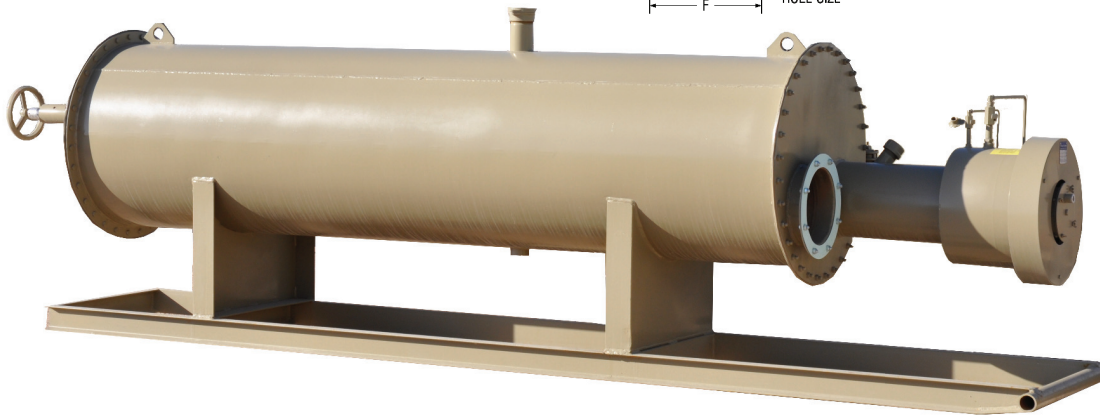
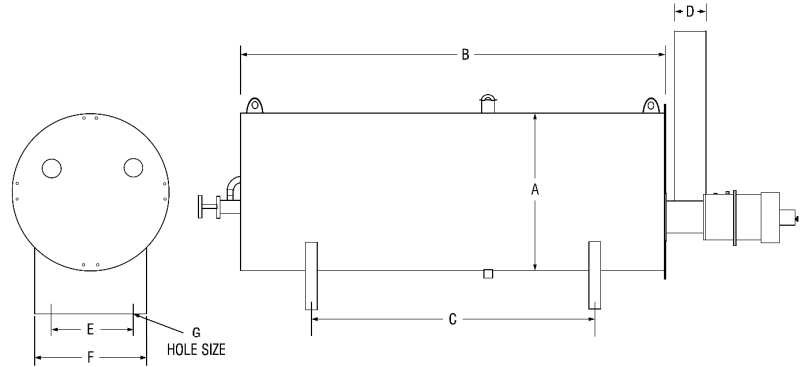
DIAMETER X HEIGHT, FEET	4' x 15'	6' x 15'	6' x 20'	8' x 15'	8' x 20'	10' x 20'	10' x 25'	10' x 30'	12' x 30'
Working pressure, PSI	75	75	75	25	25	25	25	25	25
Oil treating capacity, bbl/day	100 to 500	400 to 1200	500 to 1600	500 to 1600	700 to 2100	1100 to 3400	1400 to 4300	1700 to 5200	2500 to 7700
Gas capacity, MMCFD	1	1.5	2	3	3.5	5	5.5	6	7
Fire box capacity, BTU/HR	550,000	750,000	1,000,000	1,375,000	2,000,000	2,325,000	2,650,000	3,175,000	3,880,000
Fire box area, sq. ft.	55	75	100.5	139.5	201	235.5	268.5	320.3	395.6
Fire tube size	12"	16"	16"	2-14"	2-14"	2-18"	2-18"	2-18"	2-24"
Stack size	12"	16"	16"	14"	14"	18"	18"	18"	24"
Settling section volume, bbl	21.5	52	68	69.4	88.4	144.7	179.8	217.8	324.7
Total oil and water volume, bbl	28.1	64.3	74.1	115.9	147.9	241.6	300.3	355.4	542.3
Inlet size	3"	4"	4"	4"	6"	6"	6"	6"	6"
Oil outlet size	3"	3"	3"	3"	3"	4"	4"	4"	4"
Water outlet size	3"	4"	4"	6"	6"	6"	6"	6"	6"
Gas outlet size	3"	3"	3"	3"	3"	3"	4"	4"	4"
Drain size	3"	3"	3"	3"	3"	3"	3"	3"	3"
Relief valve size	2"	2"	2"	2"	2"	2"	2"	3"	3"
No. of 16" manways	2	2	2	2	2	2	2	2	2



PROCESS EQUIPMENT

Indirect Line Heaters

- Designed as standard units to heat gases and liquids safely, over a broad spectrum of temperatures and pressures
- Removable process flow coils and fire tubes provide the proper selection of heat transfer surface area and pressure drop



Nominal Dimensions

HEATER	A	B	C	D	E	F	G
BTU/HR	Ft. - In.	Ft. - In.	Ft. - In.	Ft. - In.	Ft. - In.	Ft. - In.	Ft. - In.
250,000	2'-0"	6'-0"	4'-0"	0'-8"	1'-6"	1'-9"	5/8"
500,000	2'-6"	10'-0"	6'-0"	0'-10"	1'-10"	2'-2"	5/8"
750,000	3'-0"	12'-0"	8'-0"	1'-0"	2'-23/4"	2'-71/4"	5/8"
1,000,000	3'-6"	14'-4"	9'-4"	1'-2"	2'-10"	3'-2"	5/8"
1,500,000	4'-0"	17'-6"	11'-0"	1'-4"	3'-2"	3'-6"	5/8"
2,000,000	5'-0"	20'-0"	12'-0"	1'-8"	4'-0"	4'-4"	5/8"

Specifications

Heater Input BTU/HR	Shell Size OD x Length	Std. Tubes No. and Size	Coil W.P. psi	Std. Mean Coil Area Sq. Ft.	Coil Lin. Ft. (Appx.)	Water Fill Vol., bbl	Shipping Weight, lbs
250,000	24" x 6'0"	8-2"XH	3372	25.3	44.7	2.2	1409
500,000	30" x 10'0"	8-2"XH	3372	42.2	74.7	5.9	2290
500,000	30" x 10'0"	8-2"XXH	6747	38	74.7	5.9	2570
750,000	36" x 12'0"	10-2"XH	3372	62.5	110.6	13.8	3018
750,000	36" x 12'0"	10-2"XXH	6747	53	104.3	13.8	3464
1,000,000	42" x 14'4"	12-2"XH	3372	85.7	151.6	17.7	3960
1,000,000	42" x 14'4"	12-2"XXH	6747	70.7	139.2	18.1	4695
1,000,000	42" x 14'4"	12-2 7/8" O.D.XXXH	10,000	79.8	139.2	17.7	5430
1,500,000	48" x 17'6"	14-2"XH	3372	134	237	28.8	5650
1,500,000	48" x 17'6"	14-2"XXH	6747	120.5	237	28.8	6600
1,500,000	48" x 17'6"	10-3"XXH	6300	131.4	173.1	28	7675
2,000,000	60" x 20'0"	16-2"XH	3372	175.7	311	51.8	10,110
2,000,000	60" x 20'0"	16-2"XXH	6747	158	311	51.8	11,360
2,000,000	60" x 20'0"	10-3"XXH	6300	150.4	198.1	51.2	12,240

Note: Subject to change without notice. Other combinations are available.

Gas Production Units

HEATER				
Firebox Rating, BTU/Hr	250,000	500,000	750,000	1,000,000
Height x Width	5'-3" x 2'-8"	5'-3" x 2'-8"	5'-7" x 2'-8"	5'-7" x 2'-8"
Length	8'-0"	8'-0"	10'-0"	10'-4"
Coil Size and Weight	2" X-HVY	2" X-HVY	2" XX-HVY	2" XX-HVY
Total No. Tubes	6	8	10	12
No. Tubes, Preheat/Exp.	2/4.0	4/4.0	4/6.0	4/8.0
Total Mean Coil Area, Sq. Ft.	27	35	53	68
Coil Equiv. Length, Ft.	47	61	94	121
Coil W.P., psi	3372	3372	6747	6747
Vol. Water Bath, gal	372	349	466	815
SEPARATOR				
Diameter x Length	16" x 7'-8"	16" x 7'-8"	16" x 9'-8"	20" x 10'-0"
W.P., psi	1100	1100	1438	1403
Gas Inlet Conn., Thd.	2"	2"	2"	2"
Gas Outlet Conn., Thd.	2"	2"	2"	2"
Oil and Water Outlet, Thd.	1"	1"	1"	1"
TOTAL DIMENSIONS AND WEIGHTS				
Skid Width x Length	2'-11" x 13'-0"	2'-11" x 13'-0"	2'-11" x 15'-3"	4'-0" x 15'-4"
Shipping Weight, lbs	5200	5400	6000	8100



Gas Production Unit



Free Water Knockout

Free Water Knockouts

Sizes and Volumes

Size Dia. x Length	W.P. ¹ psi	Approx. Weight lbs	Inlet Size	Water Size	Oil Size	Gas Size	Drain Size	Water Volume ² bbls/day
4'-0" x 10'-0"	50	2875	3"	3"	3"	2"	2"	1613
6'-0" x 10'-0"	50	4720	4"	4"	3"	2"	3"	3629
6'-0" x 15'-0"	50	5720	4"	4"	3"	3"	3"	5444
8'-0" x 15'-0"	50	8350	6"	6"	4"	3"	3"	9677
10'-0" x 15'-0"	50	11000	6"	6"	4"	3"	3"	15120
10'-0" x 20'-0"	50	13000	6"	6"	4"	3"	3"	20160
10'-0" x 30'-0"	50	20000	8"	8"	4"	3"	4"	30240
12'-0" x 30'-0"	50	26000	10"	10"	4"	4"	4"	43546

¹ Higher working pressures are available.

² Water volume is based on constant flow at 10 minutes of retention time.

Recommended Retention Time

Fluid Temp.	Time
60°F	30 minutes
70°F	25 minutes
80°F	20 minutes
90°F	15 minutes
100°F +	10 minutes

United States

Colorado

Denver
Phone: 720 897 4026

Grand Junction
Phone: 970 243 7300
Fax: 970 243 8360

Louisiana

Houma
Phone: 985 872 5215
Fax: 985 872 9816

New Iberia
Phone: 337 365 2582
Toll Free: 800 982 6882
Fax: 337 365 0120

Scott
Phone: 337 233 9310
Toll Free: 800 544 3437
Fax: 337 233 4256

Shreveport
Phone: 318 221 7005
Fax: 318 221 7008

Oklahoma

Oklahoma City
Phone: 405 670 8771
Fax: 405 670 8775

Tulsa
Phone: 918 447 4600
Toll Free: 800 324 9478
Fax: 918 447 4677

Pennsylvania

Washington
Phone: 724 222 2600
Fax: 724 222 3100

Texas

Alice
Phone: 361 664 2300
Fax: 361 664 2357

Fort Worth
Phone: 817 696 0800
Fax: 817 696 0805

Houston
Phone: 281 517 3100
Toll Free: 800 800 4110
Fax: 281 517 0340

Kilgore
Phone: 903 983 3531
Fax: 903 983 5212

Odessa — W 2nd Street
Phone: 432 333 4196
Fax: 432 333 4747

Odessa — Mankins Avenue
Phone: 432 367 0711
Fax: 432 362 9465

Wyoming

Casper
Phone: 307 235 2751
Fax: 307 265 2484

International

Argentina

Buenos Aires
Phone: 54 11 4735 4301
Fax: 54 11 4763 3490

Australia

Brisbane, Queensland
Phone: 61 407 732 922

Brazil

Macaé, Rio de Janeiro
Phone: 55 22 2796 9200
24-hours: 55 22 8111 1400
Fax: 55 22 2773 3631

Canada

Edmonton, Alberta
Phone: 780 414 7616
Toll Free: 866 855 7867

China

Beijing
Phone: 86 10 5707 0900
Fax: 86 10 5977 6100

Libya

Tripoli
Phone: 21821 7144274, ext. 108
Fax: 21821 7205704

Russia

Moscow
Phone: 7 495 775 2540
Fax: 7 495 981 3470

Singapore

Phone: 65 6513 3640
Fax: 65 6266 6471

Saudi Arabia

Dammam
Phone: 966 53 6000859

United Arab Emirates

Jebel Ali, Dubai
Phone: 971 4 811 0100
Fax: 971 4 811 0285

United Kingdom

Aberdeen
Phone: 44 0 1224 771877
Fax: 44 0 1224 771848

Gateshead
Phone: 44 0 191 4820022
Fax: 44 0 191 4878835

Venezuela

Anaco
Phone: 58 282 4255329
Fax: 58 282 4221854

Maracaibo
Phone: 58 261 7362636
Fax: 58 261 7362636

Downhole Solutions

Drilling Solutions

Engineering and Project Management Solutions

Lifting and Handling Solutions

Production Solutions

Supply Chain Solutions

Tubular and Corrosion Control Solutions

Well Service and Completion Solutions

Corporate Headquarters
7909 Parkwood Circle Drive
Houston, Texas 77036
United States
Phone: 713 375 3700
Toll Free: 888 262 8645

Mailing Address
P.O. Box 4638
Houston, Texas 77210
United States

Customer Service
3800 Mankins Avenue
Odessa, Texas 79764
United States
Phone: 432 367 0711
Fax: 432 362 9465

National Oilwell Varco has produced this brochure for general information only, and it is not intended for design purposes. Although every effort has been made to maintain the accuracy and reliability of its contents, National Oilwell Varco in no way assumes responsibility for liability for any loss, damage or injury resulting from the use of information and data herein. All applications for the material described are at the user's risk and are the user's responsibility. All brands listed are trademarks of National Oilwell Varco.

 **NATIONAL OILWELL VARCO**

One Company . . . Unlimited Solutions

mission@nov.com

www.nov.com/mission