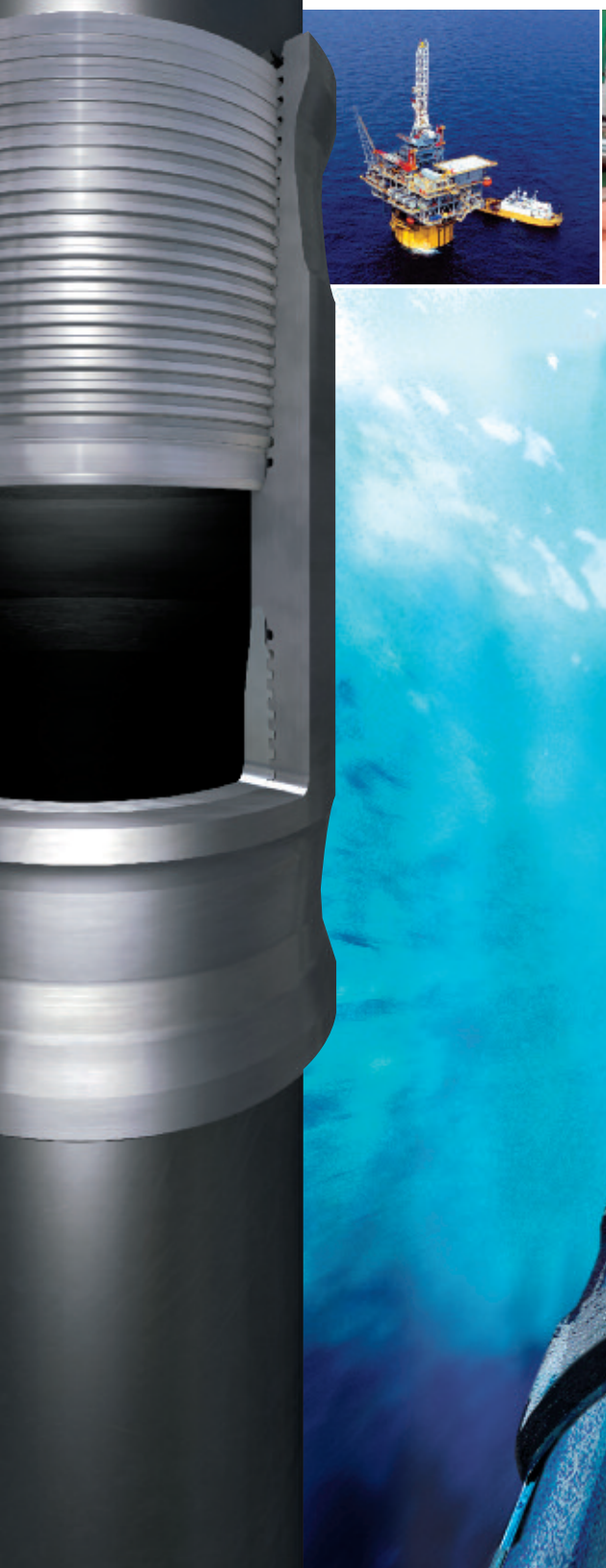
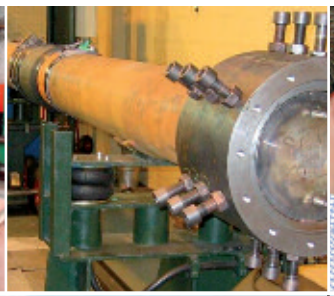
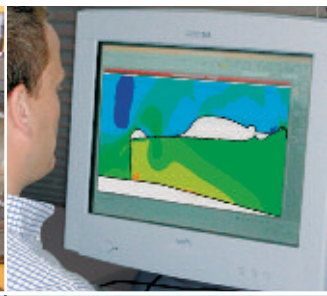
VAM® TOP FE

At the TOP in Fatigue Performance

…meeting your Drilling & Production Riser requirements





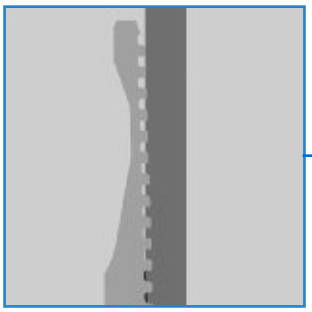


- VAM® 21
- VAM® TOP
- VAM® TOP HC
- VAM® TOP HT
- VAM® SLIJ II
- VAM® FJL
- VAM® HTF
- DINO VAM®
- BIG OMEGA™
- **VAM® TOP FE**
- VAM® TTR
- VAM® LDR
- VAM® HW ST
- VAM® MUST

SUMITOMO METALS

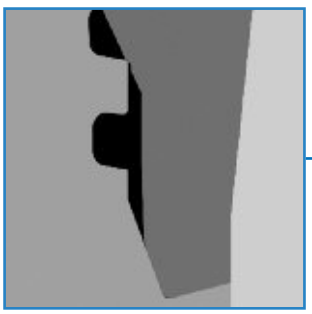
VAM® TOP FE

Swoosh



Fatigue enhanced thread form

Increased coupling O.D.



Seal geometry

Application designed for …

Drilling Riser

- Typical life time: couple of weeks, re-usable, 'run & bury'
- Typical sizes: 9 5/8″, 13 3/8″, 16″
- Typical grades: L-80, P-110

Production / Inner Riser

- Typical life time: 25 years
- Typical sizes: 9 5/8″, 10 3/4″, 11 7/8″, 13 3/8″, 13 5/8″, 16″
- Special proprietary grades: such as 110 Sour Service

Services & capacities

When fatigue performance reaches the TOP

Capacities you should know about

- Sizes » 4 1/2″ - 16″ «
- Grades » all up to high strength 125 ksi « high collapse HC or sour service
- ask also for CTOD and full string in P-110

Services to take advantage of

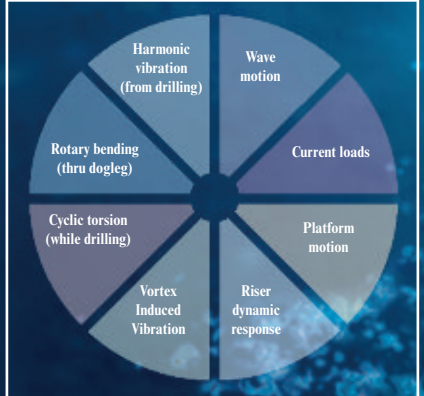
- riser team - design specialty parts
- field assistance - running, inspection
- VAM® LICENSEE worldwide network
- local threading and production

10,000 ft record depth

… se

… and field proven.

CYCLIC LOADS



VAM® TOP FE
The formular of success based on

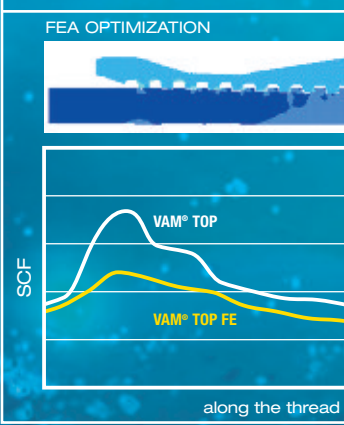
VAM® TOP
- the industry reference standard
- extensive qualification tests
- excellent running and reliability

Development / optimization
Qualification / validation

FE package
- optimized coupling geometry
- flexible coupling OD - swoosh design
- extended overall fatigue performance

Engineering expertise
- understanding of customer fatigue application
- a combination of material, connection and fatigue
- combined R&D and testing resources

Stress Concentration Factor



✓ State-of-the-art FEA techniques for Stress Concentration evaluation

✓ Parameters and conditions adapted to each customer needs

eing the riser world from a different point of view

VAM®
RISER

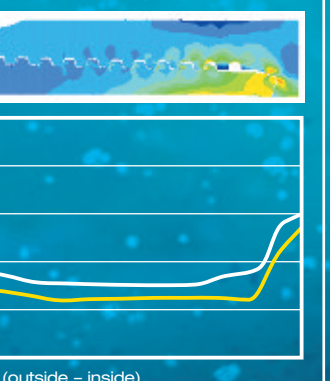
1000 ft

5000 ft

10000 ft

meet
your
target

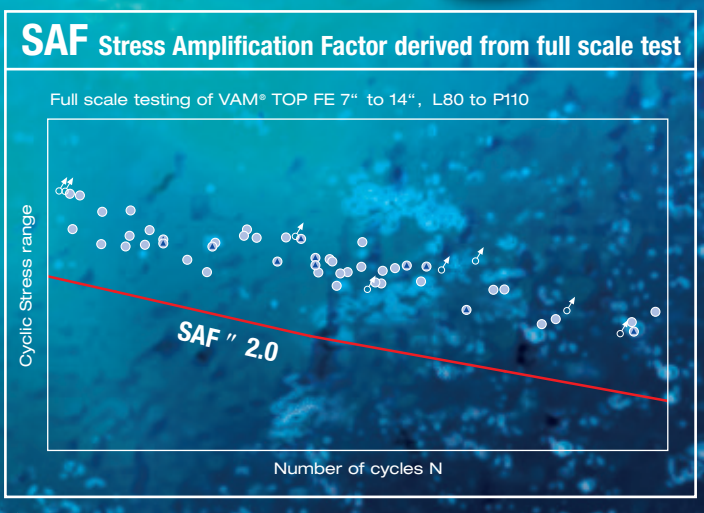
derived from FEA **SCF**



(outside – inside)

✓ 30% to 40% reduction of
SCF over standard VAM® TOP

SAF Stress Amplification Factor derived from full scale test



Run-out (not failed) Failures Failures under mean tension

Joint Yield Strengths are calculated from the minimum specified material yield stress. Connection joint efficiency is equal to 122% PBYS.

Size O.D.	Nominal weight	Plain End weight	Wall thickness		Drift diameter	Coupling O.D.	Make-up loss	Coupling length	Pipe body section	VAM® TOP FE Regular yield strength (1000lb.)			
inch / mm	lb./ft.	lb./ft.	inch	mm	inch	inch	inch	inch	sq.in.	80	95	110	125
6 5/8 168.28	36.70	36.39	0.562	14.27	5.376	7.702	4.427	11.693	10.705	856	1017	1178	1338
	23.00	22.60	0.317	8.05	6.250 A	7.601	4.776	11.535	6.655	532	632	732	832
	26.00	25.70	0.362	9.19	6.151	7.691	4.776	11.535	7.549	604	717	830	944
	29.00	28.70	0.408	10.36	6.059	7.782	4.776	11.535	8.449	676	803	929	1056
7 177.80	32.00	31.70	0.453	11.51	6.000 A	7.868	4.776	11.535	9.317	745	885	1025	1165
	35.00	34.60	0.498	12.65	5.879	7.952	4.776	11.535	10.172	814	966	1119	1272
	38.00	37.30	0.540	13.72	5.795	8.029	4.776	11.535	10.959	877	1041	1205	1370
	41.00	40.40	0.590	14.99	5.695	8.117	4.776	11.535	11.881	950	1129	1307	1485
	42.70	42.60	0.625	15.88	5.625	8.178	4.776	11.575	12.517	1001	1189	1377	1565
	26.40	25.60	0.328	8.33	6.844	8.248	4.868	11.732	7.519	602	714	827	940
	29.70	29.00	0.375	9.53	6.750	8.344	4.868	11.732	8.541	683	811	940	1068
	33.70	33.00	0.430	10.92	6.640	8.452	4.868	11.732	9.720	778	923	1069	1215
7 5/8 193.68	35.80	35.60	0.465	11.81	6.570	8.520	4.868	11.732	10.460	837	994	1151	1308
	39.00	38.00	0.500	12.70	6.500	8.587	4.868	11.732	11.192	895	1063	1231	1399
	42.80	42.40	0.562	14.27	6.376	8.701	4.868	11.732	12.470	998	1185	1372	1559
	45.30	44.70	0.595	15.11	6.310	8.761	4.868	11.732	13.141	1051	1248	1446	1643
	47.10	46.70	0.625	15.88	6.250	8.815	4.868	11.732	13.744	1100	1306	1512	1718
7 3/4 196.85	46.10	45.50	0.595	15.11	6.500 A	8.886	4.915	11.850	13.374	1070	1271	1471	1672
8 203.20	32.00	30.54	0.375	9.53	7.125	8.719	4.915	11.850	8.983	719	853	988	1123
	36.00	35.10	0.400	10.16	7.700	9.406	5.604	13.189	10.336	827	982	1137	1292
8 5/8 219.08	40.00	39.30	0.450	11.43	7.625 A	9.506	5.604	13.189	11.557	925	1098	1271	1445
	44.00	43.40	0.500	12.70	7.500	9.604	5.604	13.189	12.763	1021	1212	1404	1595
	49.00	48.00	0.557	14.15	7.386	9.713	5.604	13.189	14.118	1129	1341	1553	1765
	52.00	51.00	0.595	15.11	7.310	9.784	5.604	13.189	15.010	1201	1426	1651	1876
	40.00	38.90	0.395	10.03	8.750 A	10.404	5.589	13.189	11.454	916	1088	1260	1432
9 5/8 244.48	43.50	42.70	0.435	11.05	8.599	10.486	5.589	13.189	12.559	1005	1193	1381	1570
	47.00	46.10	0.472	11.99	8.525	10.561	5.589	13.189	13.572	1086	1289	1493	1697
	53.50	52.90	0.545	13.84	8.500 A	10.705	5.589	13.189	15.546	1244	1477	1710	1943
	58.40	57.40	0.595	15.11	8.375 A	10.801	5.589	13.189	16.879	1350	1604	1857	2110
	62.80	61.70	0.625	15.88	8.500 A	11.118	5.484	12.953	18.162	1453	1725	1998	2270
	65.30	64.00	0.650	16.51	8.419	11.165	5.484	12.953	18.838	1507	1790	2072	2355
	66.40	65.00	0.661	16.79	8.397	11.186	5.484	12.992	19.134	1531	1818	2105	2392
9 7/8 250.83	66.90	65.70	0.668	16.97	8.383	11.199	5.484	13.031	19.322	1546	1836	2125	2415
	67.50	66.60	0.678	17.22	8.363	11.217	5.484	13.031	19.590	1567	1861	2155	2449
	68.00	68.00	0.694	17.63	8.331	11.247	5.484	13.071	20.017	1601	1902	2202	2502
	68.90	68.60	0.700	17.78	8.319	11.258	5.484	13.110	20.177	1614	1917	2219	2522
	70.50	70.40	0.720	18.29	8.279	11.294	5.484	13.150	20.708	1657	1967	2278	2589
	72.00	70.80	0.725	18.42	8.269	11.304	5.484	13.189	20.841	1667	1980	2293	2605
	45.50	44.20	0.400	10.16	9.875 A	11.544	5.634	13.268	13.006	1040	1236	1431	1626
	51.00	49.50	0.450	11.43	9.694	11.648	5.634	13.268	14.561	1165	1383	1602	1820
10 3/4 273.05	55.50	54.20	0.495	12.57	9.625 A	11.740	5.634	13.268	15.947	1276	1515	1754	1993
	60.70	59.40	0.545	13.84	9.504	11.840	5.634	13.268	17.473	1398	1660	1922	2184
	65.70	64.50	0.595	15.11	9.404	11.939	5.634	13.268	18.982	1519	1803	2088	2373
	71.10	70.10	0.650	16.51	9.294	12.045	5.634	13.268	20.625	1650	1959	2269	2578
	73.20	72.33	0.672	16.51	9.250	12.087	5.634	13.268	21.276	1702	2021	2340	2660
	54.00	52.60	0.435	11.05	10.724	12.618	5.713	13.425	15.463	1237	1469	1701	1933
11 3/4 298.45	60.00	58.80	0.489	12.42	10.625 A	12.731	5.713	13.425	17.300	1384	1644	1903	2163
	65.00	64.00	0.534	13.56	10.625 A	12.823	5.713	13.425	18.816	1505	1788	2070	2352
	71.00	69.40	0.582	14.78	10.430	12.920	5.713	13.425	20.420	1634	1940	2246	2553
11 7/8 301.63	67.80	66.50	0.550	13.97	10.619	12.982	5.713	13.425	19.568	1565	1859	2152	2446
	71.80	70.20	0.582	14.78	10.555	13.046	5.713	13.425	20.648	1652	1962	2271	2581
	61.00	59.40	0.430	10.92	12.359	14.241	5.698	13.386	17.487	1399	1661	1924	2186
	68.00	66.10	0.480	12.19	12.259	14.348	5.698	13.386	19.445	1556	1847	2139	2431
13 3/8 339.73	72.00	70.60	0.514	13.06	12.250 A	14.420	5.698	13.386	20.768	1661	1973	2284	2596
	77.00	75.30	0.550	13.97	12.119	14.494	5.698	13.386	22.160	1773	2105	2438	2770
	80.70	79.30	0.580	14.73	12.059	14.556	5.698	13.386	23.314	1865	2215	2565	2914
	85.00	82.90	0.608	15.44	12.003	14.613	5.698	13.386	24.386	1951	2317	2682	3048
	86.00	85.10	0.625	15.88	11.969	14.648	5.698	13.386	25.035	2003	2378	2754	3129
13 5/8 346.08	88.20	86.80	0.625	15.88	12.250 A	14.900	5.698	13.386	25.525	2042	2425	2808	3191
14 355.60	106.00	106.13	0.750	19.05	12.400	15.464	6.946	15.906	31.220	2498	2966	3434	3903

A: Alternate drift (special drift available upon request)

1000 lb. = 4.44822 kN

All API / proprietary grades are available upon request

Additional sizes: please ask for VAM TOP FE in the size range 4 1/2" to 5 1/2" and 16"

*VAM TOP FE is **NOT** compatible with VAM TOP*

External Pressure equal to collapse pressure calculated from API Bul 5C 3 section 2.

Minimum Internal Yield Pressure are calculated from API Bul 5C 3 section 4, formula 3.1.1. The given make-up torque are optimum values, higher make-up torque can be used if needed.

External pressure (psi)				Minimum internal yield pressure (psi)				Make-up torque (ft-lb)				Nominal weight	Size O.D.
80	95	110	125	80	95	110	125	80	95	110	125	lb./ft.	inch mm
12420	12450	17080	19410	11880	14100	16330	18560	18960	21010	23040	25130	36.70	6 5/8 168.28
3830	4140	4440	4650	6340	7530	8720	9910	10200	11200	12180	13200	23.00	
5410	5890	6230	6450	7240	8600	9960	11310	10870	11870	12860	13880	26.00	
7030	7840	8530	9110	8160	9690	11220	12750	11380	12380	13370	14390	29.00	
8600	9740	10780	11710	9060	10760	12460	14160	14200	15560	16900	18290	32.00	7
10180	11650	13030	14310	9960	11830	13700	15560	16740	18450	20130	21880	35.00	177.80
11390	13430	15130	16740	10800	12830	14850	16880	19090	21110	23120	25190	38.00	
12350	14660	16980	19300	11800	14010	16230	18440	21870	24280	26680	29140	41.00	
13010	15450	17890	20330	12500	14840	17190	19530	24050	26730	29390	32130	42.70	
3400	3710	3920	4050	6020	7150	8280	9410	12320	13690	15050	16450	26.40	
4790	5130	5350	5670	6890	8180	9470	10760	13050	14420	15780	17190	29.70	
6560	7280	7870	8340	7900	9380	10860	12340	13880	15250	16620	18020	33.70	
7690	8640	9480	10200	8540	10140	11740	13340	16160	17850	19540	21280	35.80	7 5/8
8820	10000	11080	12060	9180	10900	12620	14340	18420	20440	22450	24530	39.00	193.68
10810	12410	13930	15350	10320	12250	14190	16120	22340	24940	27520	30170	42.80	
11510	13670	15440	17100	10920	12970	15020	17070	24490	27400	30290	33260	45.30	
12040	14300	16550	18700	11480	13630	15780	17930	26570	29770	32930	36190	47.10	
11340	13320	15000	16590	10750	12760	14780	16790	24950	27900	30820	33820	46.10	7 3/4 196.85
4220	4450	4800	5060	6563	7793	9023	10254	16690	18650	20600	22600	32.00	8 203.20
4100	4350	4690	4930	6490	7710	8930	10140	13290	14280	15260	16280	36.00	
5520	6020	6390	6630	7300	8670	10040	11410	17510	19100	20670	22300	40.00	8 5/8
6950	7740	8420	8980	8120	9640	11160	12680	21740	23940	26110	28350	44.00	219.08
8570	9700	10730	11660	9040	10740	12430	14130	26520	29380	32240	35170	49.00	
9650	11010	12280	13440	9660	11470	13280	15090	29630	32940	36240	39630	52.00	
3090	3330	3470	3530	5750	6820	7900	8980	12820	13780	14740	15720	40.00	
3810	4130	4420	4620	6330	7510	8700	9890	16790	18340	19890	21480	43.50	9 5/8
4750	5090	5300	5630	6870	8150	9440	10730	20480	22580	24680	26830	47.00	244.48
6620	7340	7950	8440	7930	9410	10900	12390	27780	30990	34160	37450	53.50	
7890	8890	9770	10540	8650	10280	11900	13520	32690	36640	40560	44590	58.40	
8260	9320	10280	11140	8860	10520	12180	13840	37830	42710	47550	50000	62.80	
8880	10070	11170	12160	9220	10940	12670	14400	40410	45690	50000	50000	65.30	
9150	10400	11560	12610	9370	11130	12890	14640	41540	46990	50000	50000	66.40	
9320	10610	11810	12900	9470	11250	13020	14800	42220	47780	50000	50000	66.90	
9570	10920	12160	13310	9610	11410	13220	15020	43230	48940	50000	50000	67.50	9 7/8 250.83
9970	11400	12730	13960	9840	11680	13530	15370	44900	50000	50000	50000	68.00	
10120	11580	12940	14210	9920	11780	13650	15510	45450	50000	50000	50000	68.90	
10620	12180	13650	15030	10210	12120	14040	15950	47560	50000	50000	50000	70.50	
10740	12330	13830	15230	10280	12210	14130	16060	48030	50000	50000	50000	72.00	
2470	2590	2610	2610	5210	6190	7160	8140	15130	16510	17880	19300	45.50	
3220	3480	3660	3740	5860	6960	8060	9160	21120	23430	25730	28100	51.00	
4020	4290	4610	4850	6450	7660	8860	10070	26510	29670	32800	36040	55.50	10 3/4
5160	5580	5880	6070	7100	8430	9760	11090	32480	36570	40620	44820	60.70	273.05
6300	6970	7500	7920	7750	9200	10650	12110	38520	43570	48580	50000	65.70	
7560	8480	9290	9990	8470	10050	11640	13230	45210	50000	50000	50000	71.10	
8070	9090	10010	10820	8750	10390	12030	13670	47850	50000	50000	50000	73.20	
2440	2550	2570	2570	5180	6150	7130	8100	20090	22220	24340	26520	54.00	
3180	3440	3610	3680	5830	6920	8010	9100	27570	30900	34210	37610	60.00	11 3/4
3870	4170	4480	4690	6360	7560	8750	9940	33890	38220	42550	47000	65.00	298.45
4880	5240	5470	5760	6930	8230	9530	10840	40660	46090	50000	50000	71.00	
4090	4340	4670	4920	6480	7700	8920	10130	36100	40810	45500	50000	67.80	11 7/8
4750	5080	5290	5630	6860	8150	9430	10720	40640	46080	50000	50000	71.80	301.63
1670	1670	1670	1670	4500	5340	6190	7030	23890	26760	29620	32560	61.00	
2260	2330	2330	2330	5020	5970	6910	7850	32740	37090	41400	45870	68.00	
2670	2820	2880	2880	5380	6390	7400	8410	38770	44130	49450	50000	72.00	
3100	3340	3490	3550	5760	6840	7920	9000	45210	50000	50000	50000	77.00	13 3/8 339.73
3460	3770	4000	4140	6070	7210	8350	9490	50000	50000	50000	50000	80.70	
3870	4180	4480	4690	6360	7560	8750	9940	50000	50000	50000	50000	85.00	
4190	4420	4770	5030	6540	7770	9000	10220	50000	50000	50000	50000	86.00	
3980	4260	4570	4800	6420	7630	8830	10030	50000	50000	50000	50000	88.20	13 5/8 346.08
5870	6440	6880	7200	7500	8910	10310	18748	50000	50000	50000	50000	106.00	14 355.60

1ksi = 1000 psi
1 psi = 0.006895 Mpa
0.06895 bar
1 ft.lb. = 1.355818 Nm

The VAM® TOP FE – Fatigue Enhanced
Threaded & Coupled Riser – Best in Class for Drilling and Production to reach your next water depth down to 10000 ft

BENEFITS

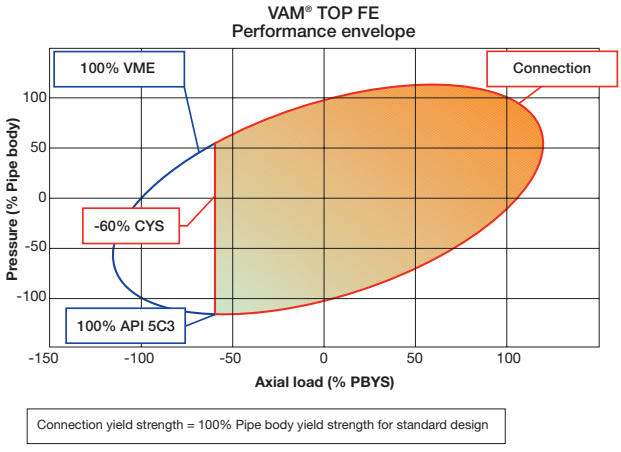
- **Field-proven design, in record-setting projects**
- **Fatigue performance, based on full-scale test**
- **Availability of higher strength (such as 110 grade), Sour Service and High Collapse steel grades**

Based on VAM® TOP

- The industry reference for premium connections
- Used in highest profile projects throughout the world
- Considered by all our customers as BEST IN CLASS

Structural Integrity
- Tension = 100% PBYS
- Compression = up to 60%
- Bending = 30 deg/100ft
- Higher torque can be applied upon request

Pressure Sealability
- Internal Pressure = 100% PBYS
- External Pressure = 100% API



Connection yield strength = 100% Pipe body yield strength for standard design

T&C opens the door for all grades in seamless

- Taking higher grades than 80 ksi you reach same or higher pipe performance with thinner wall thicknesses
- Thinner wall thicknesses save you string weight, therewith cost and helping to reach your deeper goal
- Even for Sour Service environment

Fatigue compliant connection design and riser material

- The excellent fatigue performance of VAM® TOP FE leads to a new industry standard
- Fatigue performance of VAM® TOP FE product line with SAF 2.0 or better
- Extensive qualification tests done by independent engineering companies, JIPs and in-house

Riser production and services from one single source

- Worldwide manufacturing capacities and services are available for the increasing riser properties
- VAM® TOP FE design is applicable to specialty parts such as crossovers and keel joints

SAF values are given versus DNV-B curve, based on full scale fatigue test.

Popular VAM® connections

VAM® TOP

VAM® TOP is a T&C connection ideal for tubing and production casing strings applications. VAM® TOP provides gastight sealing under the most severe conditions including great depths, highly deviated holes, and hostile environments. It outperforms the majority of today's premium connections designed according to casing and tubing requirements.

DINO VAM®

A cost effective T&C connection for surface and intermediate casing applications. Increased running reliability and reduced rig costs result from its deep stabbing, non cross-threading and fast make-up. Sealing and structural strength are provided by a coarse 3 TPI tapered, hooked thread design.

VAM® FJL

(Flush Joint Liner)

100% flush ID and OD to provide maximum clearance with optimum strength for liners, moderate depth casing, and tight-hole tubing strings.

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