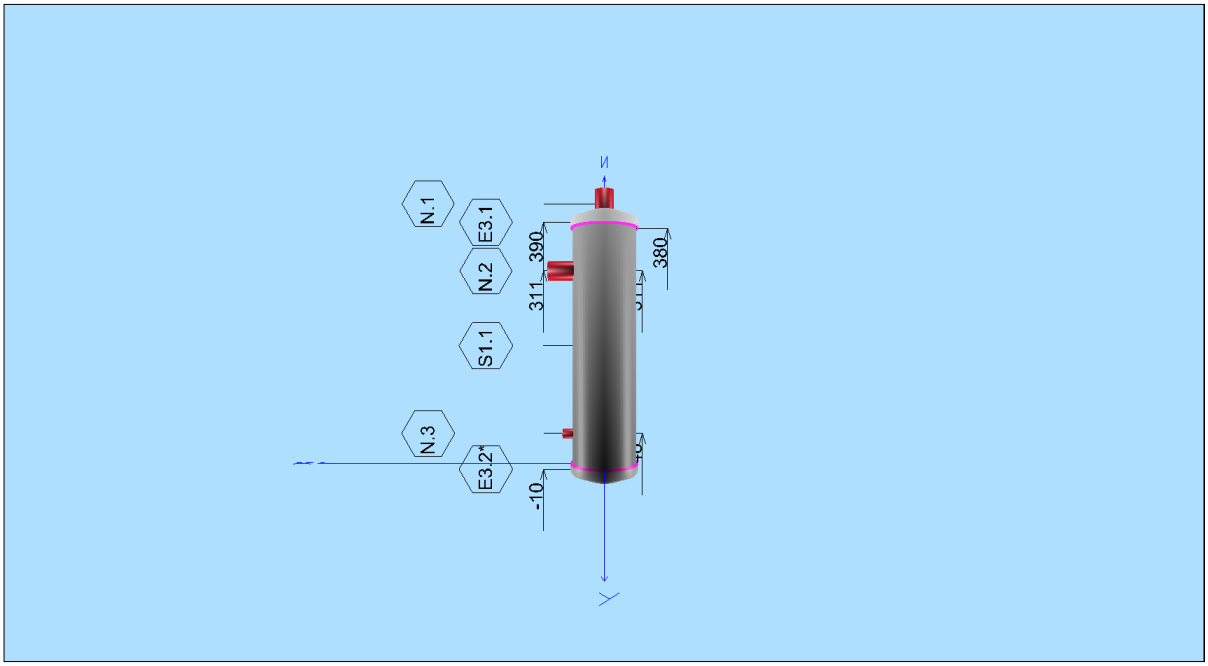
(0) Drawing

3D View of Vessel (alter by using the Save User Specified View command)

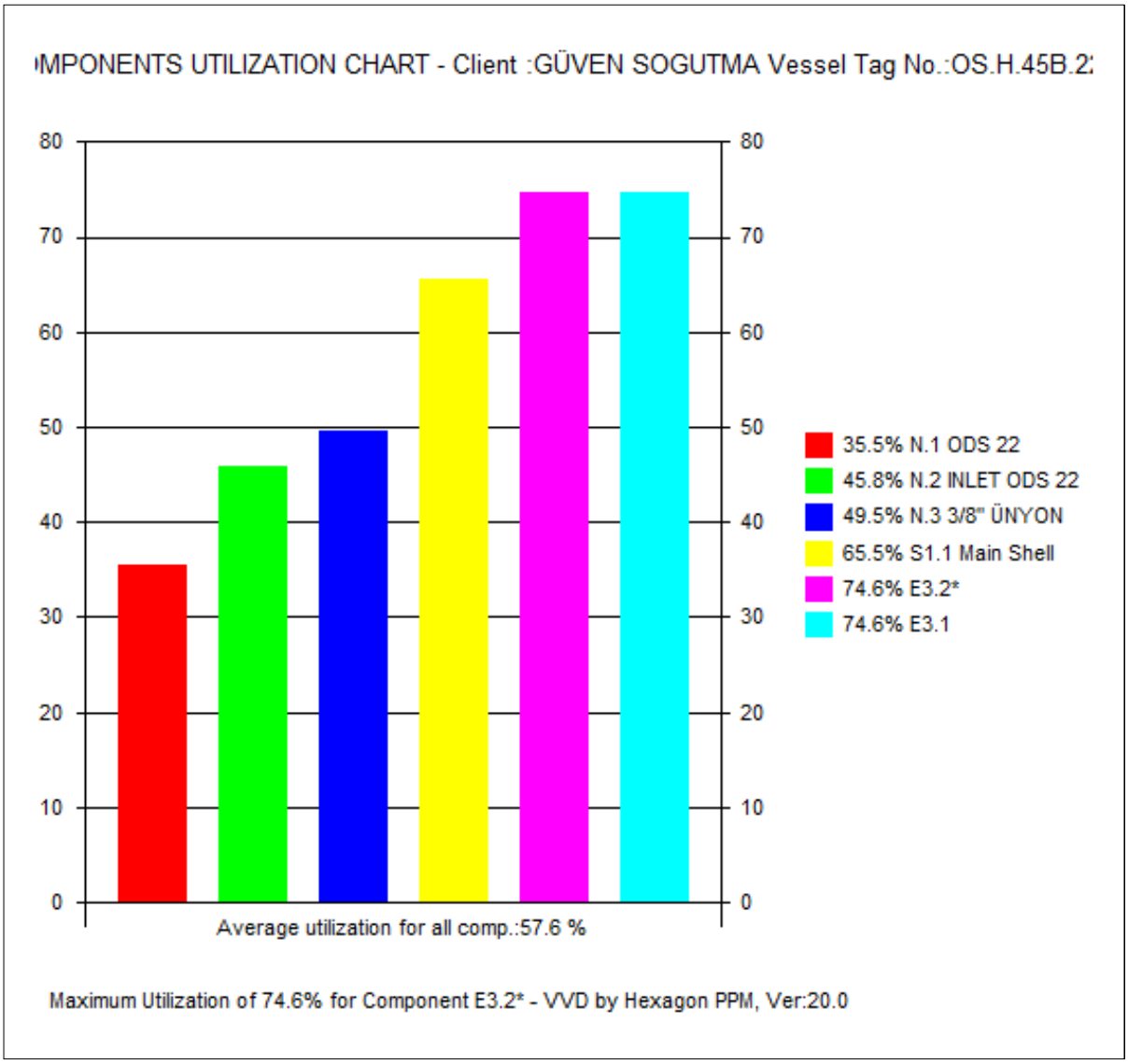


Design Data & Process Information

Description	Units	Design Data
Process Card		General Design Data
Design Code & Specifications		EN13445 TG = 3b
Internal Design Pressure (MPa)	MPa	4.5
External Design Pressure (MPa)	MPa	
Hydrotest Pressure (MPa)	MPa	
Maximum Design Temperature ('C)	'C	130
Minimum Design Temperature ('C)	'C	-20
Operating Temperature ('C)	'C	
Corrosion Allowance (mm)	mm	0.5
Content of Vessel		
Specific Density of Oper.Liq		
Normal Liquid Level NLL (mm)	mm	

Utilization Chart

Utilization Chart



Welding Information

EN1708-1 Welding Requirements for Pressurized Components
NOTE: No welding information has been specified by the user.

INPUT DATA

COMPONENT ATTACHMENT/LOCATION

GENERAL DESIGN DATA

```
PRESSURE LOADING: Design Component for Internal Pressure Only
PROCESS CARD:
General Design Data : Temp= 130°C, P=4.5000 MPa, c=0.5 mm, Pext=0.0000 MPa
SPECIFIC DENSITY OF OPERATING LIQUID.....:SG          0.00
LIQUID HEAD.....:LH          0.00 mm
```

SHELL DATA

```
CYLINDER FABRICATION: Welded Pipe
WELD JOINT COEFFICIENT: Testing Group  1   (z=1.0)
NEGATIVE TOLERANCE: Negative tolerance specified in mm
EN 10217-3:2019, 1.0565 P355NH welded tube, HT:N THK<=20mm 130'C
Rm=490 Rp=355 Rpt=292 f=194.67 f20=204.17 ftest=338.1 E=203868(N/mm2) ro=7.85
OUTSIDE DIAMETER OF SHELL.....:De        102.00 mm
LENGTH OF CYLINDRICAL PART OF SHELL.....:Lcyl      380.00 mm
NOMINAL WALL THICKNESS (uncorroded).....:en        3.0000 mm
NEGATIVE TOLERANCE/THINNING ALLOWANCE.....:th        0.3000 mm
Split shell into several shell courses and include welding information: NO
```

WELDING REQUIREMENTS TO EN 1708-1:2010

```
Comment(Optional):
Type of welded connection: Not Applicable
```

CALCULATION DATA

7.4.2 - CYLINDRICAL SHELLS UNDER INTERNAL PRESSURE

```
Required Minimum Shell Thickness Excl.Allow. emin :
emin = De * P / (2 * f * z + P)                                   (7.4-2)
=102*4.5/(2*194.67*1+4.5)=                                  1.1654 mm

Required Minimum Shell Thickness Incl.Allow. :
emina = emin + c + NegDev =1.17+0.5+0.3=                    1.9654 mm

Analysis Thickness
ea = en - c - NegDev =3-0.5-0.3=                            2.2000 mm
```

»7.4.1 Cond.of Applicabilty emin/De=0.0114 <= 0.16« » OK«

Internal Pressure emina=1.97 <= en=3[mm]	65.5%	OK

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :

```
Inside Diameter of Shell
Di = De - 2 * ea =102-2*2.2=                                  97.60 mm
Mean Diameter of Shell
Dm = (De + Di) / 2 =(102+97.6)/2=                             99.80 mm
MAWP HOT & CORR. (Corroded condition at design temp.)
MAWPHC = 2 * f * z * ea / Dm =2*194.67*1*2.2/99.8=          8.5826 MPa

MAWP NEW & COLD (Uncorroded condition at ambient temp.)
MAWPNC = 2 * f20 * z * (ea + c) / Dm
=2*204.17*1*(2.2+0.5)/99.8=                                 11.05 MPa
```

MAX TEST PRESSURE (Uncorroded cond.at ambient temp.)

```
Ptmax = 2 * ftest * ztest * (ea + c) / Dm
=2*338.1*1*(2.2+0.5)/99.8=                                  18.29 MPa
```

EN13445-5;10.2.3.3 REQUIRED MIN.HYDROSTATIC TEST PRESSURE:Ptmin

NEW AT AMBIENT TEMP. FOR TEST GROUPS 1, 2 and 3
Ptmin = 1.25 * Pd * f20 / f =1.25*4.5*204.17/194.67= 5.8995 MPa

Ptmin = 1.43 * Pd =1.43*4.5= 6.4350 MPa

Test Pressure Ptmin=6.435 <= Ptmax=18.29[MPa]	35.1%	OK

MAXIMUM DIAMETER OF UNREINFORCED OPENING IN SHELL

Inside Radius of Shell
ris = Di / 2 (9.5-3) =97.6/2= 48.80 mm
Length of Shell Contributing to Reinforcement
Is = Sqr((2 * ris + ea) * ea) (9.5-2) =Sqr((2*48.8+2.2)*2.2)= 14.82 mm
Maximum Diameter of Unreinforced Opening in Shell Checked to Rules in Section 9
dmax1 = MIN(0.5*Di,(ea*Is*(f-0.5*P)/P-ris*Is)/(0.5*ris+0.5*ea)) (9.5-7,22,23)
=MIN(0.5*97.6,(2.2*14.82*(194.67-0.5*4.5)/4.5-48.8*14.82)/(0.5*48.8+0.5*2.2
))= = 26.31 mm

Maximum diameter of Opening Not Requiring Reinforcement Check
dmax2 = 0.15 * Sqr((2 * ris + ea) * ea) (9.5-18)
=0.15*Sqr((2*48.8+2.2)*2.2)= 2.2226 mm

Maximum Diameter of Unreinforced Opening
dmax = MAX(dmax1, dmax2) =MAX(26.31,2.22)= 26.31 mm

CALCULATION SUMMARY

7.4.2 - CYLINDRICAL SHELLS UNDER INTERNAL PRESSURE

Required Minimum Shell Thickness Excl.Allow. emin :
emin = De * P / (2 * f * z + P) (7.4-2)
=102*4.5/(2*194.67*1+4.5)= 1.1654 mm

Required Minimum Shell Thickness Incl.Allow. :
emina = emin + c + NegDev =1.17+0.5+0.3= 1.9654 mm

Internal Pressure emina=1.97 <= en=3[mm]	65.5%	OK

MAX TEST PRESSURE (Uncorroded cond.at ambient temp.)

Ptmax = 2 * ftest * ztest * (ea + c) / Dm
=2*338.1*1*(2.2+0.5)/99.8= 18.29 MPa

EN13445-5;10.2.3.3 REQUIRED MIN.HYDROSTATIC TEST PRESSURE:Ptmin

NEW AT AMBIENT TEMP. FOR TEST GROUPS 1, 2 and 3
Ptmin = 1.25 * Pd * f20 / f =1.25*4.5*204.17/194.67= 5.8995 MPa

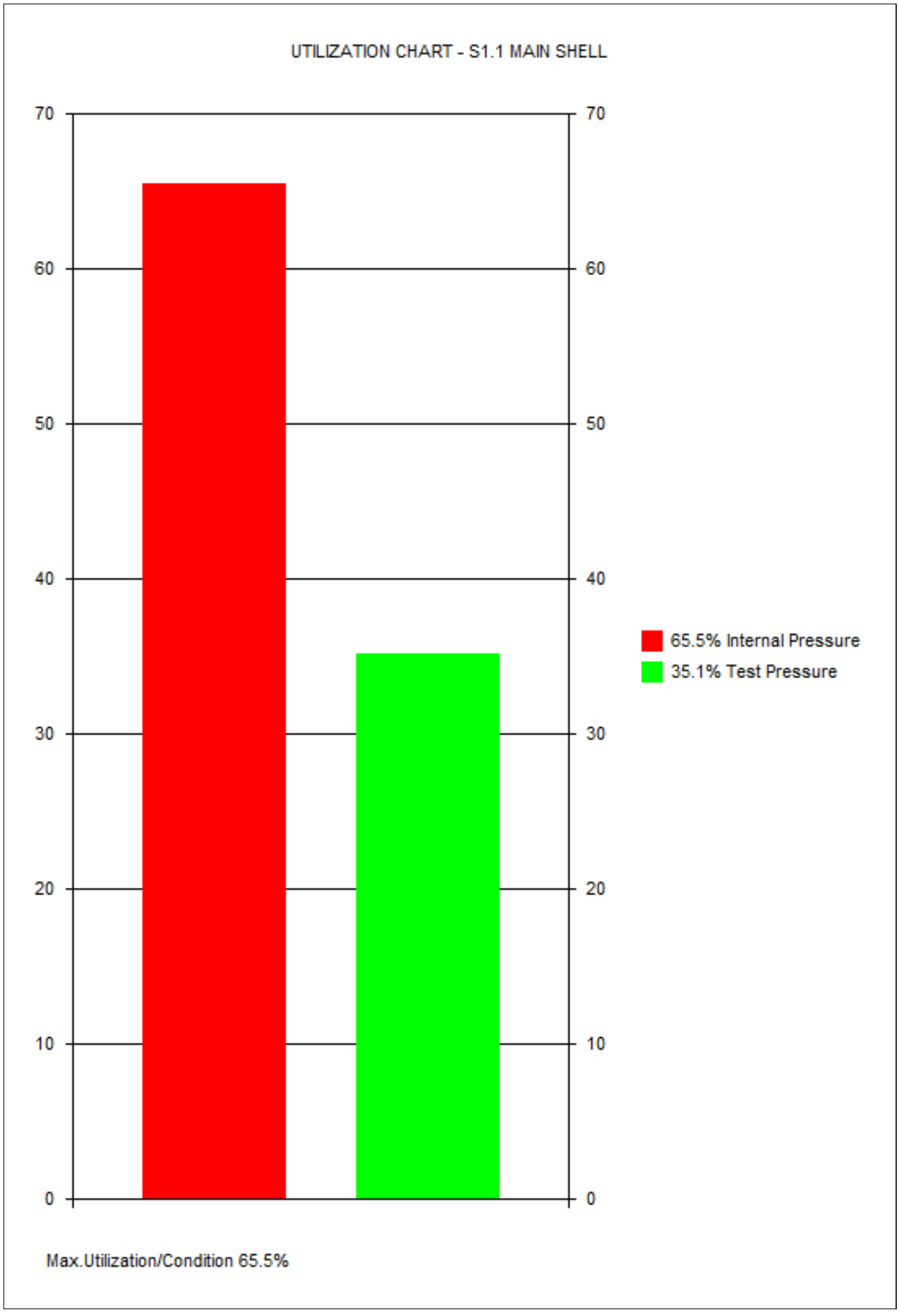
Ptmin = 1.43 * Pd =1.43*4.5= 6.4350 MPa

Test Pressure Ptmin=6.435 <= Ptmax=18.29[MPa]	35.1%	OK

MAXIMUM DIAMETER OF UNREINFORCED OPENING IN SHELL

Maximum Diameter of Unreinforced Opening
dmax = MAX(dmax1, dmax2) =MAX(26.31,2.22)= 26.31 mm

Volume:0.0028 m3 Weight:2.8 kg (SG= 7.85)


UTILIZATION CHART - S1.1 MAIN SHELL
70
60
50
40
30
20
10
0
65.5% Internal Pressure
35.1% Test Pressure
Max.Utilization/Condition 65.5%

INPUT DATA

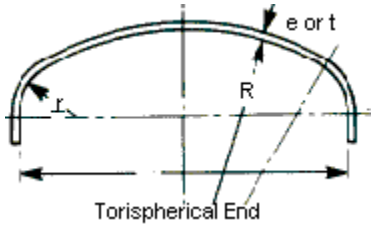
COMPONENT ATTACHMENT/LOCATION

```
Attachment: S1.1    Cylindrical Shell    Main Shell
Location: Along z-axis z1=  380
```

GENERAL DESIGN DATA

```
PRESSURE LOADING: Design Component for Internal Pressure Only
PROCESS CARD:
General Design Data : Temp= 130°C, P=4.5000 MPa, c=0.5 mm, Pext=0.0000 MPa
SPECIFIC DENSITY OF OPERATING LIQUID.................:SG          0.00
LIQUID HEAD..........................................:LH          0.00 mm
```

DIMENSIONS OF END




```
Type of Torispherical End: Dished End NOT listed above
WELD JOINT COEFFICIENT: Unwelded Component(z=1.0)
OUTSIDE DIAMETER OF CYLINDRICAL FLANGE OF END.......:De        109.00 mm
LENGTH OF CYLINDRICAL FLANGE OF END.................:Lcyl       10.00 mm
INSIDE SPHERICAL RADIUS (corroded)..................:R          76.00 mm
DEPTH OF HEAD INCLUDING HEAD THICKNESS..............:h          12.00 mm
INSIDE KNUCKLE RADIUS (corroded)....................:r         7.0000 mm
NEGATIVE TOLERANCE/THINNING ALLOWANCE...............:th        0.3000 mm
NOMINAL THICKNESS OF HEAD/END (uncorroded)..........:en        3.0000 mm
Include calculation of forming during fabrication to EN13445-4 Section 9.: NO
```

MATERIAL DATA FOR END

```
EN 10028-2:2017, 1.0473 P355GH plate and strip, HT:N THK<=16mm 130'C
Rm=510 Rp=355 Rpt=308.6 f=205.73 f20=212.5 ftest=338.1 E=203868(N/mm2) ro=7.85
Material & Delivery Form: NOT Cold Spun Seamless Austenitic Stainless Steel
```

NOZZLES IN KNUCKLE REGION TO SECTION 7.7

```
Nozzles In Knuckle Region: NO
```

WELDING REQUIREMENTS TO EN 1708-1:2010

```
Comment(Optional):
Type of welded connection: Not Applicable
```

CALCULATION DATA

7.5.3 - TORISPHERICAL ENDS UNDER INTERNAL PRESSURE

7.5.3.2 Required Minimum End Thickness

```
Required Thickness of End to Limit Membrane Stress in Central Part
es = P * R / (2 * f * z - 0.5 * P)                                  (7.5-1)
=4.5*76/(2*205.73*1-0.5*4.5)=                              0.8358 mm

fb = Rpt / 1.5 (7.5-4) =308.6/1.5=                          205.73 N/mm2
Required Thickness of Knuckle to Avoid Plastic Buckling
eb = (0.75*R+0.2*Di)*((P/(111*fb)*(Di/r)^0.825)^(0.667)             (7.5-3)
=(0.75*76+0.2*104)*((4.5/(111*205.73)*(104/7)^0.825)^(0.667)=   1.1597 mm

7.5.3.5 Formulas for Calculation of Factor Beta
Y = MIN( emin / R, 0.04) (7.5-9) =MIN(1.43/76,0.04)=          0.0189
```

```
Z = LOG( 1 / Y) (7.5-10) =LOG(1/0.0189)=                          1.7242
X = r / Di (7.5-11) =7/106.13=                                    0.0660
N = 1.006 - 1 / (6.2 + (90 * Y) ^ 4)                                    (7.5-12)
=1.006-1/(6.2+(90*0.0189)^4)=                                   0.9371
Beta006 = N*(-0.3635*Z^3+2.2124*Z^2-3.2937*Z+1.8873)                    (7.5-13)
=0.9371*(-0.3635*1.72^3+2.2124*1.72^2-3.2937*1.72+1.8873)=      0.8643
Beta01 = N*(-0.1833*Z^3+1.0383*Z^2-1.2943*Z+0.837)                       (7.5-15)
=0.9371*(-0.1833*1.72^3+1.0383*1.72^2-1.2943*1.72+0.837)=       0.7052
beta = 25 * ((0.1 - X) * Beta006 + (X - 0.06) * Beta01)                  (7.5-14)
=25*((0.1-0.066)*0.8643+(0.066-0.06)*0.7052)=                   0.8406
Required Thickness of Knuckle to Avoid Axisymmetric Yielding
ey = beta * P * (0.75 * R + 0.2 * Di) / f                                (7.5-2)
=0.8406*4.5*(0.75*76+0.2*106.13)/205.73=                        1.4383 mm
```

NOTE 3, since ey(1.4) > 0.005*Di(0.5) it is NOT necessary to calculate/consider eb.

```
Required Minimum End Thickness Excl.Allow. emin :
emin = emin =1.44=                                                1.4383 mm

Required Minimum End Thickness Incl.Allow. :
emina = emin + c + th =1.44+0.5+0.3=                              2.2400 mm
```

Internal Pressure emina=2.24 <= en=3[mm]	74.6%	OK

```
Analysis Thickness
ea = en - c - th =3-0.5-0.3=                                      2.2000 mm
Inside Diameter of Shell
Di = De - 2 * (en - c) =109-2*(3-0.5)=                            104.00 mm
Mean Diameter of Shell
Dm = (De + Di) / 2 =(109+104)/2=                                  106.50 mm
```

7.5.3.4 - Required Minimum Thickness of Straight Cylindrical Flange

```
Llim = 0.2 * SQR( Di * emin) =0.2*SQR(104*1.44)=                  2.4461 mm
Since Lcyl > Llim, Required Thickness of Straight Cylindrical Flange to 7.4.2
Minimum Thickness of Straight Flange Excl. Allow.
ecyl = P * Di / (2 * f * z - P)                                          (7.4-1)
=4.5*104/(2*205.73*1-4.5)=                                      1.1500 mm

Minimum Thickness of Straight Flange Incl.Corr. :
ecyla = ecyl + c =1.15+0.5=                                       1.6500 mm
```

7.5.3.1 Conditions of Applicability - Torispherical Ends

»Geometry Check r=7 <= 0.2 * Di=20.8[mm] « » OK«
»Geometry Check r=7 >= 0.06 * Di=6.24[mm] « » OK«
»Geometry Check r=7 >= 2*e=2.88[mm] « » OK«
»Geometry Check e=1.44 <= 0.08*De=8.72[mm] « » OK«
»Geometry Check ea=2.2 >= 0.001*De=0.109[mm] « » OK«
»Geometry Check R=76 <= De=109[mm] « » OK«

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :NEW & COLD

```
Ps = 2 * f * z * ea / (R + 0.5 * ea)                                     (7.5-6)
=2*212.5*1*2.7/(75.5+0.5*2.7)=                                  14.93 MPa
Py = f * ea / ( beta * ( 0.75 * R + 0.2 * Di))                           (7.5-7)
=212.5*2.7/(0.6396*(0.75*75.5+0.2*104))=                        11.59 MPa
PB = 111*fb*(ea/(0.75*R+0.2*Di))^1.5*(r/Di)^0.825                        (7.5-8)
=111*236.67*(2.7/(0.75*75.5+0.2*104))^1.5*(7/104)^0.825=        18.46 MPa
Pcyl = 2 * ea * f * z / (Di + ea)
=2*2.7*212.5*1/(104+2.7)=                                       10.75 MPa
Pmax (is the least of Ps, Py, Pb and Pcyl) = Pmax
=10.75=                                                         10.75 MPa
```

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :HOT & CORR

```
Ps = 2 * f * z * ea / (R + 0.5 * ea)                                  (7.5-6)
=2*205.73*1*2.2/(76+0.5*2.2)=                                  11.74 MPa
Py = f * ea / ( beta * ( 0.75 * R + 0.2 * Di))                        (7.5-7)
=205.73*2.2/(0.7057*(0.75*76+0.2*104))=                       8.2436 MPa
PB = 111*fb*(ea/(0.75*R+0.2*Di))^1.5*(r/Di)^0.825                     (7.5-8)
=111*205.73*(2.2/(0.75*76+0.2*104))^1.5*(7/104)^0.825=         11.72 MPa
Pcyl = 2 * ea * f * z / (Di + ea)
=2*2.2*205.73*1/(104+2.2)=                                    8.5237 MPa
Pmax (is the least of Ps, Py, Pb and Pcyl) = Pmax
=8.24=                                                        8.2436 MPa
```

MAX TEST PRESSURE (Uncorroded cond.at ambient temp.)

```
Ps = 2 * f * z * ea / (R + 0.5 * ea)                                  (7.5-6)
=2*338.1*1*2.7/(75.5+0.5*2.7)=                                 23.76 MPa
Py = f * ea / ( beta * ( 0.75 * R + 0.2 * Di))                        (7.5-7)
=338.1*2.7/(0.6396*(0.75*75.5+0.2*104))=                       18.43 MPa
PB = 111*fb*(ea/(0.75*R+0.2*Di))^1.5*(r/Di)^0.825                     (7.5-8)
=111*338.1*(2.7/(0.75*75.5+0.2*104))^1.5*(7/104)^0.825=        26.38 MPa
Pcyl = 2 * ea * f * z / (Di + ea)
=2*2.7*338.1*1/(104+2.7)=                                      17.11 MPa
Pmax (is the least of Ps, Py, Pb and Pcyl) = Pmax
=17.11=                                                        17.11 MPa
```

EN13445-5;10.2.3.3 REQUIRED MIN.HYDROSTATIC TEST PRESSURE:Ptmin

```
NEW AT AMBIENT TEMP. FOR TEST GROUPS 1, 2 and 3
Ptmin = 1.25 * Pd * f20 / f =1.25*4.5*212.5/205.73=             5.8101 MPa

Ptmin = 1.43 * Pd =1.43*4.5=                                    6.4350 MPa
```

Test Pressure Ptmin=6.435 <= Ptmax=17.11[MPa]	37.6%	OK

Maximum diameter of Opening Not Requiring Reinforcement Check , dmax

```
ris = R (9.5-4) =76=                                             76.00 mm
Length of Shell Contributing to Reinforcement
Is = Sqr(( 2 * ris + ea) * ea) (9.5-2) =Sqr((2*76+2.2)*2.2)=     18.42 mm
Maximum Diameter of Unreinforced Opening in Shell Checked to Rules in Section 9
dmax1 = MIN(0.5*Di,(ea*Is*(f-0.5*P)/P-ris*Is)/(0.5*ris+0.5*ea))    (9.5-7,22,23)
=MIN(0.5*104,(2.2*18.42*(205.73-0.5*4.5)/4.5-76*18.42)/(0.5*76+0.5*2.2))
=    11.06 mm

Maximum diameter of Opening Not Requiring Reinforcement Check
dmax2 = 0.15 * Sqr(( 2 * ris + ea) * ea)                              (9.5-18)
=0.15*Sqr((2*76+2.2)*2.2)=                                    2.7628 mm

Maximum Diameter of Unreinforced Opening
dmax = MAX( dmax1, dmax2) =MAX(11.06,2.76)=                     11.06 mm
```

CALCULATION SUMMARY

7.5.3 - TORISPHERICAL ENDS UNDER INTERNAL PRESSURE

7.5.3.2 Required Minimum End Thickness

```
Required Minimum End Thickness Excl.Allow. emin :
emin = emin =1.44=                                              1.4383 mm

Required Minimum End Thickness Incl.Allow. :
emina = emin + c + th =1.44+0.5+0.3=                            2.2400 mm
```

Internal Pressure emina=2.24 <= en=3[mm]	74.6%	OK

```
Minimum Thickness of Straight Flange Incl.Corr. :
ecyla = ecyl + c =1.15+0.5=                                     1.6500 mm
```

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :NEW & COLD

Pmax (is the least of Ps, Py, Pb and Pcyl) = Pmax
=10.75= 10.75 MPa

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :HOT & CORR

Pmax (is the least of Ps, Py, Pb and Pcyl) = Pmax
=8.24= 8.2436 MPa

MAX TEST PRESSURE (Uncorroded cond.at ambient temp.)

Pmax (is the least of Ps, Py, Pb and Pcyl) = Pmax
=17.11= 17.11 MPa

EN13445-5;10.2.3.3 REQUIRED MIN.HYDROSTATIC TEST PRESSURE:Ptmin

NEW AT AMBIENT TEMP. FOR TEST GROUPS 1, 2 and 3
Ptmin = 1.25 * Pd * f20 / f =1.25*4.5*212.5/205.73= 5.8101 MPa

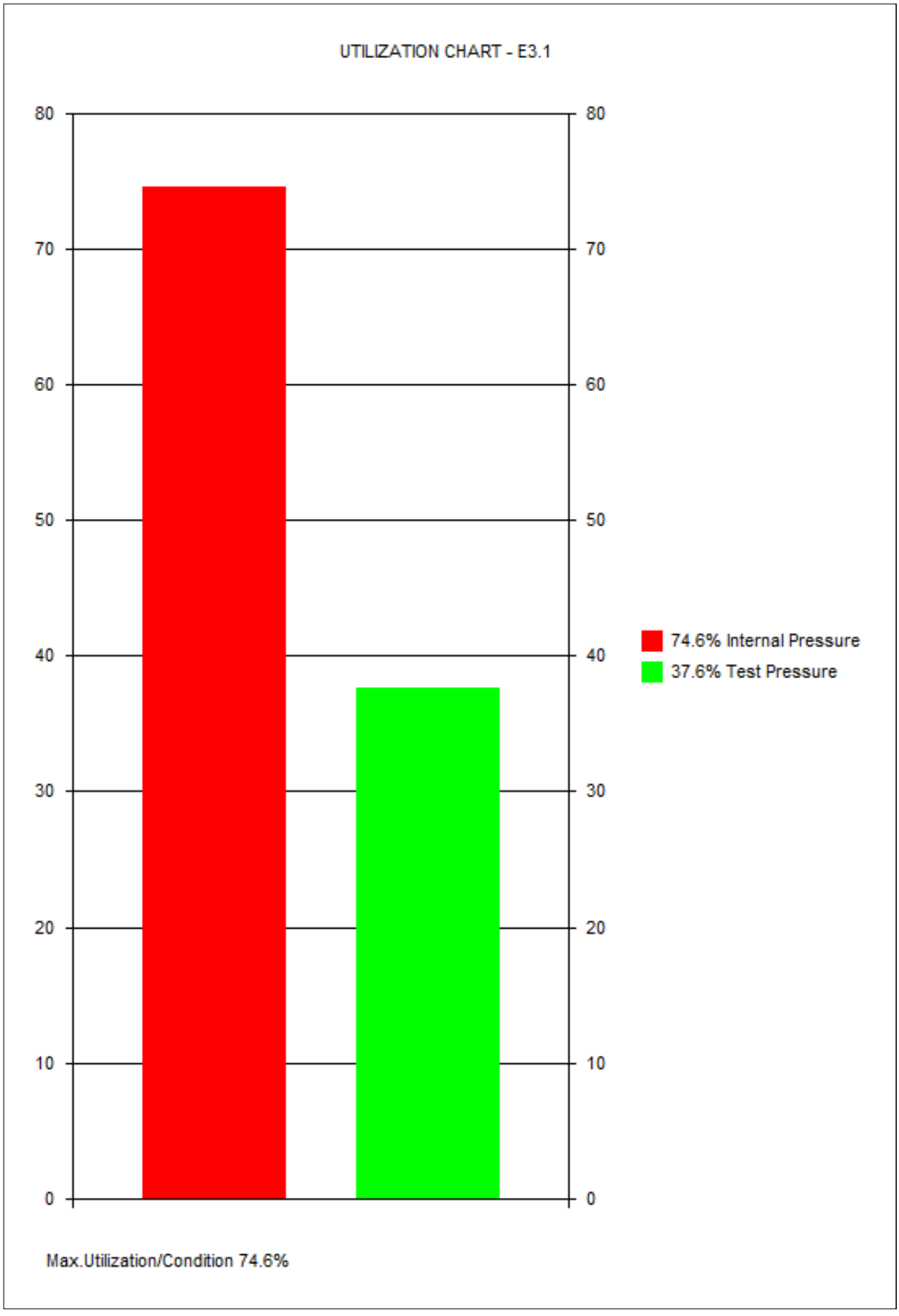
Ptmin = 1.43 * Pd =1.43*4.5= 6.4350 MPa

Test Pressure Ptmin=6.435 <= Ptmax=17.11[MPa]	37.6%	OK

Maximum diameter of Opening Not Requiring Reinforcement Check , dmax

Maximum Diameter of Unreinforced Opening
dmax = MAX(dmax1, dmax2) =MAX(11.06,2.76)= 11.06 mm

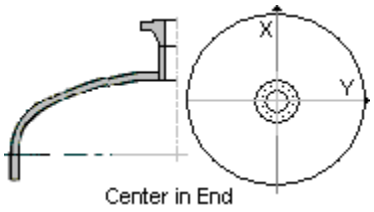
Volume:0.0001300 m3 Weight:0.3 kg (SG= 7.85)


UTILIZATION CHART - E3.1
80
70
60
50
40
30
20
10
0
74.6% Internal Pressure
37.6% Test Pressure
Max.Utilization/Condition 74.6%

INPUT DATA

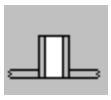
COMPONENT ATTACHMENT/LOCATION

```
Attachment: E3.1    Torispherical End                                    S1.1
Connect this nozzle to the nozzle neck of another nozzle: NO
```




```
Orientation & Location of Nozzle: Center in End
```

GENERAL DESIGN DATA



```
Type of Opening: Nozzle Without Standard ASME or DIN/EN Flange Attachment
PRESSURE LOADING: Design Component for Internal Pressure Only
PROCESS CARD:
General Design Data : Temp= 130°C, P=4.5000 MPa, c=0.5 mm, Pext=0.0000 MPa
SPECIFIC DENSITY OF OPERATING LIQUID.................:SG          0.00
LIQUID HEAD.........................................:LH          0.00 mm
Apply a different corrosion allowance to nozzle neck than the shell thickness.: NO
Include Nozzle Load Calculation: NO
```

SHELL DATA (E3.1)

```
Shell Type: Torispherical End
OUTSIDE DIAMETER OF SHELL............................:De        109.00 mm
NOMINAL WALL THICKNESS (uncorroded)..................:en        3.0000 mm
NEGATIVE TOLERANCE/THINNING ALLOWANCE................:th        0.3000 mm
INSIDE SPHERICAL RADIUS (corroded)...................:R          76.00 mm
EN 10028-2:2017, 1.0473 P355GH plate and strip, HT:N THK<=16mm 130'C
Rm=510 Rp=355 Rpt=308.6 fs=205.73 f20=212.5 ftest=338.1 E=203868(N/mm2) ro=7.85
```

NOZZLE MATERIAL DATA

```
Delivery Form: Seamless Pipe
EN 10216-2:2013, 1.0345 P235GH seamless tube, HT:N THK<=16mm 130'C
Rm=360 Rp=235 Rpt=191.4 fb=127.6 f20=150 ftest=223.81 E=203868(N/mm2) ro=7.85
```

NOZZLE DIMENSIONAL DATA

```
Attachment: Set In Flush Nozzle
Shape of Nozzle/Opening: Circular
Application:
9.4.6.3 NOT a critical fatigue area, and calc.temp.is outside creep range.
OUTSIDE NOZZLE DIAMETER..............................:deb        30.90 mm
NOMINAL NOZZLE THICKNESS (uncorroded)................:enb       6.4500 mm
Size of Flange and Nozzle:
Comment (Optional):
NEGATIVE TOLERANCE/THINNING ALLOWANCE................:          12.50 %
NOZZLE STANDOUT MEASURED FROM VESSEL OD..............:ho         40.00 mm
```

WELDING DATA

```
Nozzle/Pad to Shell Welding Area: User Specified Fillet Weld Throat Dimensions
OUTWARD NOZZLE WELD, THROAT DIMENSION..............:mo        2.0000 mm
Nozzle Weld Intersect: Nozzle Does NOT Intersect with a Welded Shell Seam
ANGLE BETWN.BRANCH AXIS AND A LINE NORMAL TO MAIN BODY:Phi       0.00 Degr.
```

DATA FOR REINFORCEMENT PAD

```
Type of Pad: No Pad
```

LIMITS OF REINFORCEMENT

```
Reduction of Limits of Reinforcement: No Reduction Required
```

WELDING REQUIREMENTS TO EN 1708-1:2010

```
Comment(Optional):
Type of welded connection: Not Applicable
```

CALCULATION DATA

PRELIMINARY CALCULATIONS

```
Shell Analysis Thickness eas
eas = en - c - th =3-0.5-0.3=                          2.2000 mm
Nozzle Analysis Thickness eab
eab = enb - cn - NegDev =6.45-0.5-0.8063=              5.1438 mm
ris = R (9.5-4) =76=                                    76.00 mm
dib = deb - 2 * eab =30.9-2*5.14=                       20.61 mm
Min.Nozzle Thk.Based on Internal Pressure ebp
ebp = P * deb / (2 * fb * z + P)
=4.5*30.9/(2*127.6*1+4.5)=                           0.5400 mm
Allowable Stresses
fob = Min( fs, fb) (9.5-8) =Min(205.73,127.6)=          127.60 N/mm2
```

GEOMETRIC LIMITATIONS

»Check Max.Diameter of Nozzle dib/De=0.1891 <= 0.60=0.6[mm] (9.4.5.3)«» OK«

Min.Nozzle Thk. ebp=0.54 <= eab=5.14[mm]	10.4%	OK

»Location in End to Fig.9.5-4 L=39.05 >= De/10=10.9[mm] « » OK«

9.5.2.4.4 Nozzles normal to the shell, with or without reinforcement pads.

Calculation of Stress Loaded Areas Effective as Reinforcement

Area of Shell Afs

```
Limit of Reinforcement Along Shell
Iso = Sqr(( 2 * ris + eas) * eas)
=Sqr((2*76+2.2)*2.2)=                                18.42 mm
Set In Nozzle
Afs = eas * Is (9.5-79) =2.2*18.42=                    40.52 mm2
```

Area of Nozzle Afb

```
Limit of Reinforcement Along Nozzle (outside shell)
Ibo = MIN( Sqr(( deb - eb) * eb), ho)                          (9.5-76)
=MIN(Sqr((30.9-5.14)*5.14,)40)=                      11.51 mm
Set In Nozzle
Afb = eb * (Ibo + Ibi + eas) (9.5-78) =5.14*(11.51+0+2.2)=     70.52 mm2
```

Area of Welds Afw

```
Afw = mo ^ 2 =2^2=                                          4.0000 mm2
```

Calculation of Pressure Loaded Areas

```
In the Nozzle Apb
Apb = 0.5 * dib * (Ibo + eas) (9.5-84) =0.5*20.61*(11.51+2.2)=   141.30 mm2

Spherical Shell/End on any Section Aps
Aps = 0.5 * ris ^ 2 * (Is + a) / (0.5 * eas + ris)                  (9.5-105)
=0.5*76^2*(18.42+15.56)/(0.5*2.2+76)=                        1272.58 mm2
```

9.5.2 Reinforcement Rules

Pressure Area Required pA(req.)

```
pAReq = P * (Aps + Apb + 0.5 * Apphi)                               (9.5-7)
=4.5*(1272.58+141.3+0.5*0)=                                  6.3625 kN
```

Pressure Area Available pA(aval.)

```
pAAval = (Afs+Afw)*(fs-0.5*P)+Afp*(fop-0.5*P)+Afb*(fob-0.5*P)       (9.5-7)
=(40.52+4)*(205.73-0.5*4.5)+0*(0-0.5*4.5)+70.52*(127.6-0.5*4.5)=    17.90 kN
```

Nozzle Reinforcement pAAval=17.9 >= pAReq=6.36[kN]	35.5%	OK

Maximum Allowable Pressure Pmax

```
Pmax = (Afs+Afw)*fs+Afb*fob/((Aps+Apb+0.5*Apphi)+0.5*(Afs+Afw+Afb+Afp)) (9.5-10)
=(40.52+4)*205.73+70.52*127.6/((1272.58+141.3+0.5*0)+0.5*(40.52+4+70.52+0))
=    12.34 MPa
```

Max.Allowable Test Pressure Ptmax

```
Ptmax =  ==                                                  23.98 MPa
```

```
Weight of Nozzle: .1734kg
```

CALCULATION SUMMARY

Min.Nozzle Thk. ebp=0.54 <= eab=5.14[mm]	10.4%	OK

9.5.2.4.4 Nozzles normal to the shell, with or without reinforcement pads.

```
Limit of Reinforcement Along Shell
Iso = Sqr(( 2 * ris + eas) * eas)
=Sqr((2*76+2.2)*2.2)=                                        18.42 mm
Limit of Reinforcement Along Nozzle (outside shell)
Ibo = MIN( Sqr(( deb - eb) * eb), ho)                               (9.5-76)
=MIN(Sqr((30.9-5.14)*5.14,)40)=                              11.51 mm
```

Pressure Area Required pA(req.)

```
pAReq = P * (Aps + Apb + 0.5 * Apphi)                               (9.5-7)
=4.5*(1272.58+141.3+0.5*0)=                                  6.3625 kN
```

Pressure Area Available pA(aval.)

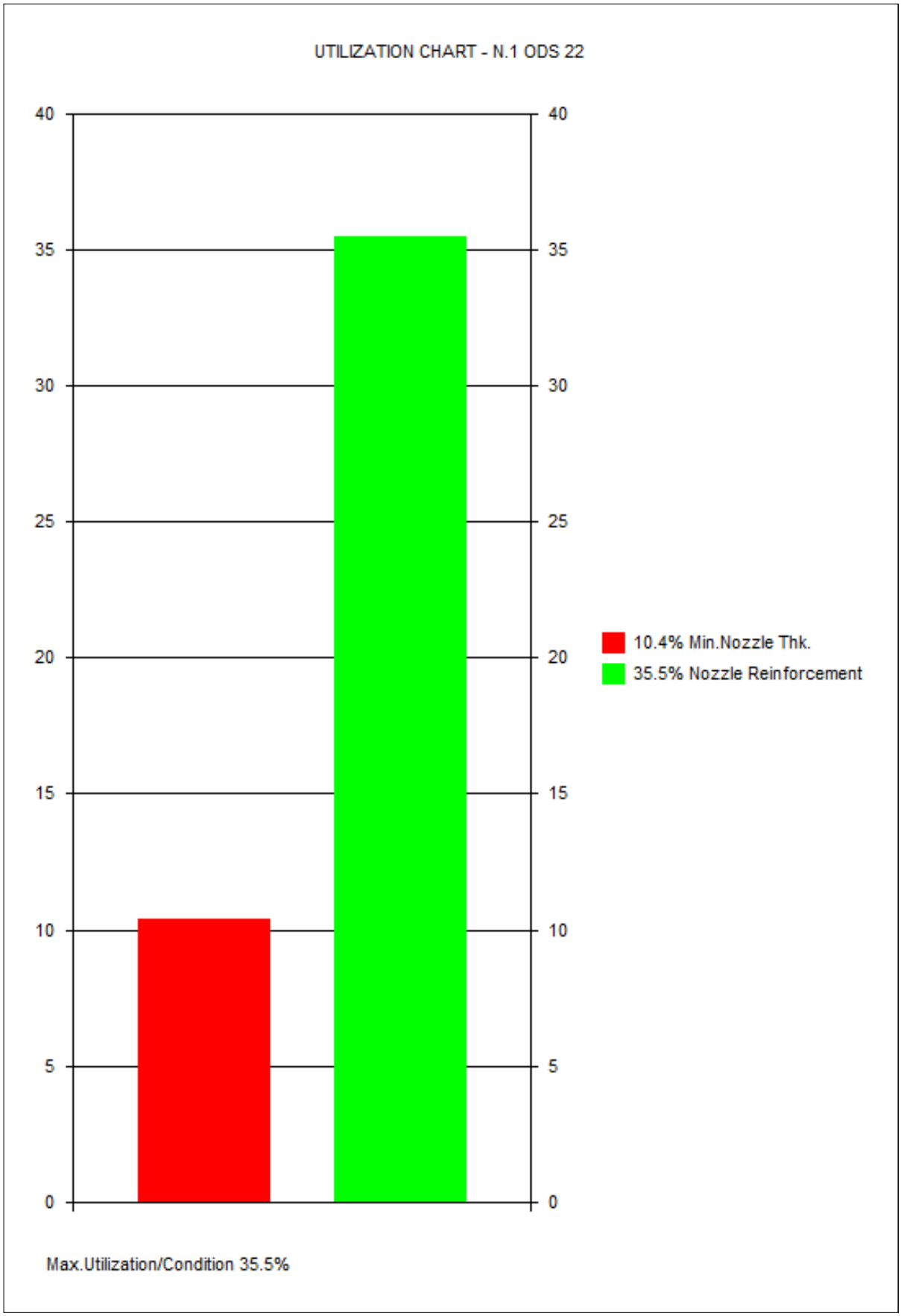
```
pAAval = (Afs+Afw)*(fs-0.5*P)+Afp*(fop-0.5*P)+Afb*(fob-0.5*P)       (9.5-7)
=(40.52+4)*(205.73-0.5*4.5)+0*(0-0.5*4.5)+70.52*(127.6-0.5*4.5)=    17.90 kN
```

Nozzle Reinforcement pAAval=17.9 >= pAReq=6.36[kN]	35.5%	OK

Maximum Allowable Pressure Pmax

```
Pmax = (Afs+Afw)*fs+Afb*fob/((Aps+Apb+0.5*Apphi)+0.5*(Afs+Afw+Afb+Afp)) (9.5-10)
=(40.52+4)*205.73+70.52*127.6/((1272.58+141.3+0.5*0)+0.5*(40.52+4+70.52+0))
=    12.34 MPa
```

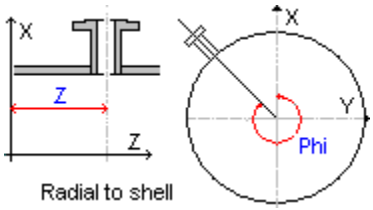
Volume:0.00 m3 Weight:0.2 kg (SG= 7.85)


UTILIZATION CHART - N.1 ODS 22
40
35
30
25
20
15
10
5
0
10.4% Min.Nozzle Thk.
35.5% Nozzle Reinforcement
Max.Utilization/Condition 35.5%

INPUT DATA

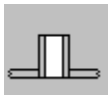
COMPONENT ATTACHMENT/LOCATION

```
Attachment: S1.1    Cylindrical Shell    Main Shell
Connect this nozzle to the nozzle neck of another nozzle: NO
```




```
Orientation & Location of Nozzle: Radial to Shell
z-location of nozzle along axis of attacment.....:z         311.00 mm
Angle of Rotation of nozzle axis projected in the x-y plane:Phi     0.00 Degr.
```

GENERAL DESIGN DATA



```
Type of Opening: Nozzle Without Standard ASME or DIN/EN Flange Attachment
PRESSURE LOADING: Design Component for Internal Pressure Only
PROCESS CARD:
General Design Data : Temp= 130°C, P=4.5000 MPa, c=0.5 mm, Pext=0.0000 MPa
SPECIFIC DENSITY OF OPERATING LIQUID.....:SG          0.00
LIQUID HEAD.....:LH          0.00 mm
Apply a different corrosion allowance to nozzle neck than the shell thickness.: NO
Include Nozzle Load Calculation: NO
```

SHELL DATA (S1.1)

```
Shell Type: Cylindrical Shell
OUTSIDE DIAMETER OF SHELL.....:De        102.00 mm
NOMINAL WALL THICKNESS (uncorroded).....:en        3.0000 mm
NEGATIVE TOLERANCE/THINNING ALLOWANCE.....:th        0.3000 mm
EN 10217-3:2019, 1.0565 P355NH welded tube, HT:N THK<=20mm 130'C
Rm=490 Rp=355 Rpt=292 fs=194.67 f20=204.17 ftest=338.1 E=203868(N/mm2) ro=7.85
```

NOZZLE MATERIAL DATA

```
Delivery Form: Seamless Pipe
EN 10216-2:2013, 1.0345 P235GH seamless tube, HT:N THK<=16mm 130'C
Rm=360 Rp=235 Rpt=191.4 fb=127.6 f20=150 ftest=223.81 E=203868(N/mm2) ro=7.85
```

NOZZLE DIMENSIONAL DATA

```
Attachment: Set In Flush Nozzle
Shape of Nozzle/Opening: Circular
Application:
9.4.6.3 NOT a critical fatigue area, and calc.temp.is outside creep range.
OUTSIDE NOZZLE DIAMETER.............................:deb        30.90 mm
NOMINAL NOZZLE THICKNESS (uncorroded)...............:enb       6.4500 mm
Size of Flange and Nozzle:
Comment (Optional):
NEGATIVE TOLERANCE/THINNING ALLOWANCE...............:           12.50 %
NOZZLE STANDOUT MEASURED FROM VESSEL OD.............:ho         40.00 mm
```

WELDING DATA

```
Nozzle/Pad to Shell Welding Area: User Specified Fillet Weld Throat Dimensions
OUTWARD NOZZLE WELD, THROAT DIMENSION...............:mo        2.0000 mm
Nozzle Weld Intersect: Nozzle Does NOT Intersect with a Welded Shell Seam
ANGLE PhiC(OBLIQUE IN TRANSVERSE.CROSS SECT.)Fig.9.5-2:PhiC      0.00 Degr.
ANGLE PhiL(OBLIQUE IN LONG.CROSS SECT.)Fig.9.5-1....:PhiL        0.00 Degr.
```

DATA FOR REINFORCEMENT PAD

```
Type of Pad: No Pad
```

LIMITS OF REINFORCEMENT

```
Reduction of Limits of Reinforcement: No Reduction Required
```

WELDING REQUIREMENTS TO EN 1708-1:2010

```
Comment(Optional):
Type of welded connection: Not Applicable
```

CALCULATION DATA

PRELIMINARY CALCULATIONS

```
Shell Analysis Thickness eas
eas = en - c - th =3-0.5-0.3=                              2.2000 mm
Nozzle Analysis Thickness eab
eab = enb - cn - NegDev =6.45-0.5-0.8063=                  5.1438 mm
Inside Radius of Curvature
ris = De / 2 - eas (9.5-3) =102/2-2.2=                      48.80 mm
dib = deb - 2 * eab =30.9-2*5.14=                           20.61 mm
Min.Nozzle Thk.Based on Internal Pressure ebp
ebp = P * deb / (2 * fb * z + P)
=4.5*30.9/(2*127.6*1+4.5)=                               0.5400 mm
Allowable Stresses
fob = Min( fs, fb) (9.5-8) =Min(194.67,127.6)=               127.60 N/mm2
```

GEOMETRIC LIMITATIONS

»Check Max.Diameter of Nozzle dib/(2*ris)=0.2112 <= 1.00=1[mm] «» OK«

Min.Nozzle Thk. ebp=0.54 <= eab=5.14[mm]	10.4%	OK

9.5.2.4.4 Nozzles normal to the shell, with or without reinforcement pads.

Calculation of Stress Loaded Areas Effective as Reinforcement

Area of Shell Afs

```
Limit of Reinforcement Along Shell
Iso = Sqr(( 2 * ris + eas) * eas)
=Sqr((2*48.8+2.2)*2.2)=                                  14.82 mm
Set In Nozzle
Afs = eas * Is (9.5-79) =2.2*14.82=                      32.60 mm2
```

Area of Nozzle Afb

```
Limit of Reinforcement Along Nozzle (outside shell)
Ibo = MIN( Sqr(( deb - eb) * eb), ho)                          (9.5-76)
=MIN(Sqr((30.9-5.14)*5.14,)40)=                          11.51 mm
Set In Nozzle
Afb = eb * (Ibo + Ibi + eas) (9.5-78) =5.14*(11.51+0+2.2)=   70.52 mm2
```

Area of Welds Afw

```
Afw = mo ^ 2 =2^2=                                        4.0000 mm2
```

Calculation of Pressure Loaded Areas

```
In the Nozzle Apb
Apb = 0.5 * dib * (Ibo + eas) (9.5-84) =0.5*20.61*(11.51+2.2)=   141.30 mm2

Cyl.Shell in the Longitudinal Section Aps
ApsL = ris * (Is + a) (9.5-94) =48.8*(14.82+15.45)=      1477.06 mm2

Cyl.Shell in the Transverse Cross Section Aps
ApsT = 0.5 * ris ^ 2 * (Is + a ) / (0.5 * eas + ris)           (9.5-105)
=0.5*48.8^2*(14.82+15.71)/(0.5*2.2+48.8)=                728.41 mm2

Aps = MAX( ApsL ApsT) =MAX(1477.06,728.41)=              1477.06 mm2
```

9.5.2 Reinforcement Rules

Pressure Area Required pA(req.)

```
pAReqL = P * (ApsL + Apb + 0.5 * ApphiL)                       (9.5-7)
=4.5*(1477.06+141.3+0.5*0)=                              7.2826 kN

pAReqT = P * (ApsT + Apb + 0.5 * Apphi)                        (9.5-7)
=4.5*(728.41+141.3+0.5*0)=                               3.9137 kN

pAReq = MAX( pAReqL, pAReqT) =MAX(7282.61,3913.69)=       7.2826 kN
```

Pressure Area Available pA(aval.)

```
pAAval = (Afs+Afw)*(fs-0.5*P)+Afp*(fop-0.5*P)+Afb*(fob-0.5*P)      (9.5-7)
=(32.6+4)*(194.67-0.5*4.5)+0*(0-0.5*4.5)+70.52*(127.6-0.5*4.5)=    15.88 kN
```

Nozzle Reinforcement pAAval=15.88 >= pAReq=7.28[kN]	45.8%	OK

Maximum Allowable Pressure Pmax

```
Pmax = (Afs+Afw)*fs+Afb*fob/((ApsL+Apb)+0.5*(Afs+Afw+Afb+Afp))     (9.5-10)
=(32.6+4)*194.67+70.52*127.6/((1477.06+141.3)+0.5*(32.6+4+70.52+0))
=   9.6435 MPa
```

Max.Allowable Test Pressure Ptmax

```
Ptmax =  ==                                               19.18 MPa

Weight of Nozzle: .1772kg
```

CALCULATION SUMMARY

Min.Nozzle Thk. ebp=0.54 <= eab=5.14[mm]	10.4%	OK

9.5.2.4.4 Nozzles normal to the shell, with or without reinforcement pads.

```
Limit of Reinforcement Along Shell
Iso = Sqr(( 2 * ris + eas) * eas)
=Sqr((2*48.8+2.2)*2.2)=                                   14.82 mm
Limit of Reinforcement Along Nozzle (outside shell)
Ibo = MIN( Sqr(( deb - eb) * eb), ho)                              (9.5-76)
=MIN(Sqr((30.9-5.14)*5.14,)40)=                           11.51 mm
```

Pressure Area Required pA(req.)

```
pAReqL = P * (ApsL + Apb + 0.5 * ApphiL)                           (9.5-7)
=4.5*(1477.06+141.3+0.5*0)=                              7.2826 kN

pAReqT = P * (ApsT + Apb + 0.5 * Apphi)                            (9.5-7)
=4.5*(728.41+141.3+0.5*0)=                               3.9137 kN

pAReq = MAX( pAReqL, pAReqT) =MAX(7282.61,3913.69)=       7.2826 kN
```

Pressure Area Available pA(aval.)

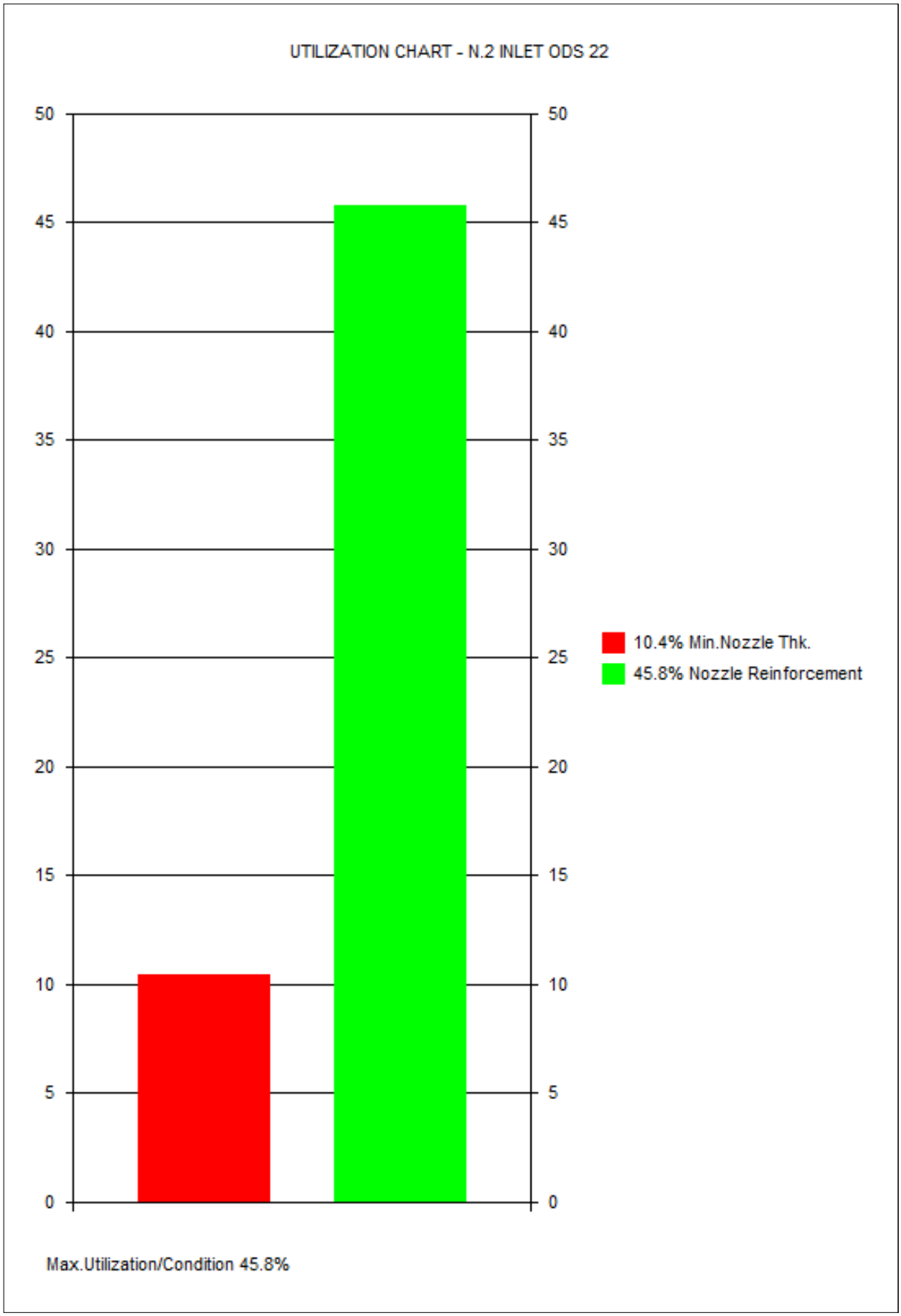
```
pAAval = (Afs+Afw)*(fs-0.5*P)+Afp*(fop-0.5*P)+Afb*(fob-0.5*P)      (9.5-7)
=(32.6+4)*(194.67-0.5*4.5)+0*(0-0.5*4.5)+70.52*(127.6-0.5*4.5)=    15.88 kN
```

Nozzle Reinforcement pAAval=15.88 >= pAReq=7.28[kN]	45.8%	OK

Maximum Allowable Pressure Pmax

```
Pmax = (Afs+Afw)*fs+Afb*fob/((ApsL+Apb)+0.5*(Afs+Afw+Afb+Afp))     (9.5-10)
=(32.6+4)*194.67+70.52*127.6/((1477.06+141.3)+0.5*(32.6+4+70.52+0))
=   9.6435 MPa
```

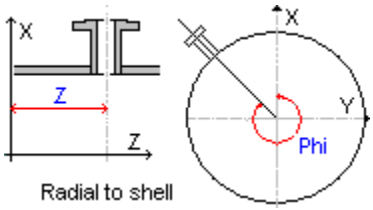
Volume:0.00 m3 Weight:0.2 kg (SG= 7.85)


UTILIZATION CHART - N.2 INLET ODS 22
50
45
40
35
30
25
20
15
10
5
0
10.4% Min.Nozzle Thk.
45.8% Nozzle Reinforcement
Max.Utilization/Condition 45.8%

INPUT DATA

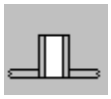
COMPONENT ATTACHMENT/LOCATION

```
Attachment: S1.1    Cylindrical Shell    Main Shell
Connect this nozzle to the nozzle neck of another nozzle: NO
```




```
Orientation & Location of Nozzle: Radial to Shell
z-location of nozzle along axis of attacment.....:z          48.00 mm
Angle of Rotation of nozzle axis projected in the x-y plane:Phi     0.00 Degr.
```

GENERAL DESIGN DATA



```
Type of Opening: Nozzle Without Standard ASME or DIN/EN Flange Attachment
PRESSURE LOADING: Design Component for Internal Pressure Only
PROCESS CARD:
General Design Data : Temp= 130°C, P=4.5000 MPa, c=0.5 mm, Pext=0.0000 MPa
SPECIFIC DENSITY OF OPERATING LIQUID.....:SG          0.00
LIQUID HEAD.....:LH          0.00 mm
Apply a different corrosion allowance to nozzle neck than the shell thickness.: NO
Include Nozzle Load Calculation: NO
```

SHELL DATA (S1.1)

```
Shell Type: Cylindrical Shell
OUTSIDE DIAMETER OF SHELL.....:De        102.00 mm
NOMINAL WALL THICKNESS (uncorroded).....:en        3.0000 mm
NEGATIVE TOLERANCE/THINNING ALLOWANCE.....:th        0.3000 mm
EN 10217-3:2019, 1.0565 P355NH welded tube, HT:N THK<=20mm 130'C
Rm=490 Rp=355 Rpt=292 fs=194.67 f20=204.17 ftest=338.1 E=203868(N/mm2) ro=7.85
```

NOZZLE MATERIAL DATA

```
Delivery Form: Seamless Pipe
EN 10216-2:2013, 1.0345 P235GH seamless tube, HT:N THK<=16mm 130'C
Rm=360 Rp=235 Rpt=191.4 fb=127.6 f20=150 ftest=223.81 E=203868(N/mm2) ro=7.85
```

NOZZLE DIMENSIONAL DATA

```
Attachment: Set In Flush Nozzle
Shape of Nozzle/Opening: Circular
Application:
9.4.6.3 NOT a critical fatigue area, and calc.temp.is outside creep range.
OUTSIDE NOZZLE DIAMETER.............................:deb        16.00 mm
NOMINAL NOZZLE THICKNESS (uncorroded)...............:enb       4.5000 mm
Size of Flange and Nozzle:
Comment (Optional):
NEGATIVE TOLERANCE/THINNING ALLOWANCE...............:           12.50 %
NOZZLE STANDOUT MEASURED FROM VESSEL OD.............:ho         16.50 mm
```

WELDING DATA

```
Nozzle/Pad to Shell Welding Area: User Specified Fillet Weld Throat Dimensions
OUTWARD NOZZLE WELD, THROAT DIMENSION...............:mo        1.5000 mm
Nozzle Weld Intersect: Nozzle Does NOT Intersect with a Welded Shell Seam
ANGLE PhiC(OBLIQUE IN TRANSVERSE.CROSS SECT.)Fig.9.5-2:PhiC      0.00 Degr.
ANGLE PhiL(OBLIQUE IN LONG.CROSS SECT.)Fig.9.5-1....:PhiL        0.00 Degr.
```

DATA FOR REINFORCEMENT PAD

```
Type of Pad: No Pad
```

LIMITS OF REINFORCEMENT

```
Reduction of Limits of Reinforcement: No Reduction Required
```

WELDING REQUIREMENTS TO EN 1708-1:2010

```
Comment(Optional):
Type of welded connection: Not Applicable
```

CALCULATION DATA

PRELIMINARY CALCULATIONS

```
Shell Analysis Thickness eas
eas = en - c - th =3-0.5-0.3=                              2.2000 mm
Nozzle Analysis Thickness eab
eab = enb - cn - NegDev =4.5-0.5-0.5625=                   3.4375 mm
Inside Radius of Curvature
ris = De / 2 - eas (9.5-3) =102/2-2.2=                      48.80 mm
dib = deb - 2 * eab =16-2*3.4375=                          9.1250 mm
Min.Nozzle Thk.Based on Internal Pressure ebp
ebp = P * deb / (2 * fb * z + P)
=4.5*16/(2*127.6*1+4.5)=                                  0.2800 mm
Allowable Stresses
fob = Min( fs, fb) (9.5-8) =Min(194.67,127.6)=               127.60 N/mm2
```

GEOMETRIC LIMITATIONS

»Check Max.Diameter of Nozzle dib/(2*ris)=0.0935 <= 1.00=1[mm] «» OK«

Min.Nozzle Thk. ebp=0.28 <= eab=3.4375[mm]	8.1%	OK

9.5.2.4.4 Nozzles normal to the shell, with or without reinforcement pads.

Calculation of Stress Loaded Areas Effective as Reinforcement

Area of Shell Afs

```
Limit of Reinforcement Along Shell
Iso = Sqr(( 2 * ris + eas) * eas)
=Sqr((2*48.8+2.2)*2.2)=                                  14.82 mm
Set In Nozzle
Afs = eas * Is (9.5-79) =2.2*14.82=                      32.60 mm2
```

Area of Nozzle Afb

```
Limit of Reinforcement Along Nozzle (outside shell)
Ibo = MIN( Sqr(( deb - eb) * eb), ho)                              (9.5-76)
=MIN(Sqr((16-3.4375)*3.4375,)16.5)=                      6.5714 mm
Set In Nozzle
Afb = eb * (Ibo + Ibi + eas) (9.5-78) =3.4375*(6.57+0+2.2)=  30.15 mm2
```

Area of Welds Afw

```
Afw = mo ^ 2 =1.5^2=                                      2.2500 mm2
```

Calculation of Pressure Loaded Areas

```
In the Nozzle Apb
Apb = 0.5 * dib * (Ibo + eas) (9.5-84) =0.5*9.125*(6.57+2.2)=   40.02 mm2

Cyl.Shell in the Longitudinal Section Aps
ApsL = ris * (Is + a) (9.5-94) =48.8*(14.82+8)=           1113.50 mm2

Cyl.Shell in the Transverse Cross Section Aps
ApsT = 0.5 * ris ^ 2 * (Is + a ) / (0.5 * eas + ris)               (9.5-105)
=0.5*48.8^2*(14.82+8.03)/(0.5*2.2+48.8)=                 545.30 mm2

Aps = MAX( ApsL ApsT) =MAX(1113.5,545.3)=                 1113.50 mm2
```

9.5.2 Reinforcement Rules

Pressure Area Required pA(req.)

```
pAReqL = P * (ApsL + Apb + 0.5 * ApphiL)                           (9.5-7)
=4.5*(1113.5+40.02+0.5*0)=                               5.1908 kN

pAReqT = P * (ApsT + Apb + 0.5 * Apphi)                            (9.5-7)
=4.5*(545.3+40.02+0.5*0)=                                2.6340 kN

pAReq = MAX( pAReqL, pAReqT) =MAX(5190.82,2633.95)=        5.1908 kN
```

Pressure Area Available pA(aval.)

```
pAAval = (Afs+Afw)*(fs-0.5*P)+Afp*(fop-0.5*P)+Afb*(fob-0.5*P)      (9.5-7)
=(32.6+2.25)*(194.67-0.5*4.5)+0*(0-0.5*4.5)+30.15*(127.6-0.5*4.5)=   10.49 kN
```

Nozzle Reinforcement pAAval=10.49 >= pAReq=5.19[kN]	49.5%	OK

Maximum Allowable Pressure Pmax

```
Pmax = (Afs+Afw)*fs+Afb*fob/((ApsL+Apb)+0.5*(Afs+Afw+Afb+Afp))     (9.5-10)
=(32.6+2.25)*194.67+30.15*127.6/((1113.5+40.02)+0.5*(32.6+2.25+30.15+0))
=   8.9639 MPa
```

Max.Allowable Test Pressure Ptmax

```
Ptmax =  ==                                               18.47 MPa

Weight of Nozzle: .0257kg
```

CALCULATION SUMMARY

Min.Nozzle Thk. ebp=0.28 <= eab=3.4375[mm]	8.1%	OK

9.5.2.4.4 Nozzles normal to the shell, with or without reinforcement pads.

```
Limit of Reinforcement Along Shell
Iso = Sqr(( 2 * ris + eas) * eas)
=Sqr((2*48.8+2.2)*2.2)=                                   14.82 mm
Limit of Reinforcement Along Nozzle (outside shell)
Ibo = MIN( Sqr(( deb - eb) * eb), ho)                              (9.5-76)
=MIN(Sqr((16-3.4375)*3.4375,)16.5)=                      6.5714 mm
```

Pressure Area Required pA(req.)

```
pAReqL = P * (ApsL + Apb + 0.5 * ApphiL)                           (9.5-7)
=4.5*(1113.5+40.02+0.5*0)=                               5.1908 kN

pAReqT = P * (ApsT + Apb + 0.5 * Apphi)                            (9.5-7)
=4.5*(545.3+40.02+0.5*0)=                                2.6340 kN

pAReq = MAX( pAReqL, pAReqT) =MAX(5190.82,2633.95)=        5.1908 kN
```

Pressure Area Available pA(aval.)

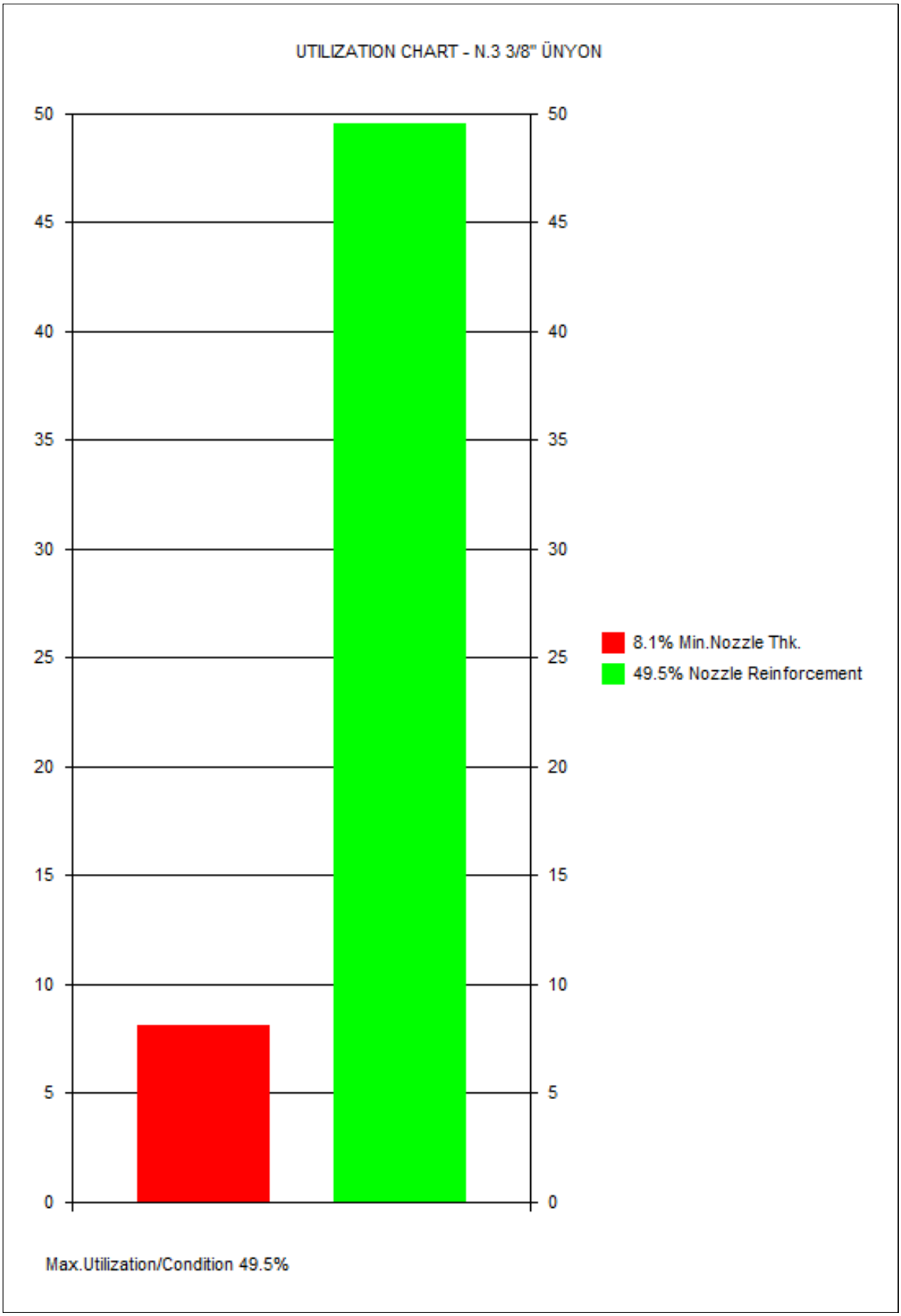
```
pAAval = (Afs+Afw)*(fs-0.5*P)+Afp*(fop-0.5*P)+Afb*(fob-0.5*P)       (9.5-7)
=(32.6+2.25)*(194.67-0.5*4.5)+0*(0-0.5*4.5)+30.15*(127.6-0.5*4.5)=    10.49 kN
```

Nozzle Reinforcement pAAval=10.49 >= pAReq=5.19[kN]	49.5%	OK

Maximum Allowable Pressure Pmax

```
Pmax = (Afs+Afw)*fs+Afb*fob/((ApsL+Apb)+0.5*(Afs+Afw+Afb+Afp))      (9.5-10)
=(32.6+2.25)*194.67+30.15*127.6/((1113.5+40.02)+0.5*(32.6+2.25+30.15+0))
=   8.9639 MPa
```

Volume:0.00 m3 Weight:0 kg (SG= 7.85)


UTILIZATION CHART - N.3 3/8" ÜNYON
50
45
40
35
30
25
20
15
10
5
0
8.1% Min.Nozzle Thk.
49.5% Nozzle Reinforcement
Max.Utilization/Condition 49.5%