Stabilirea duratei remanente de viata.

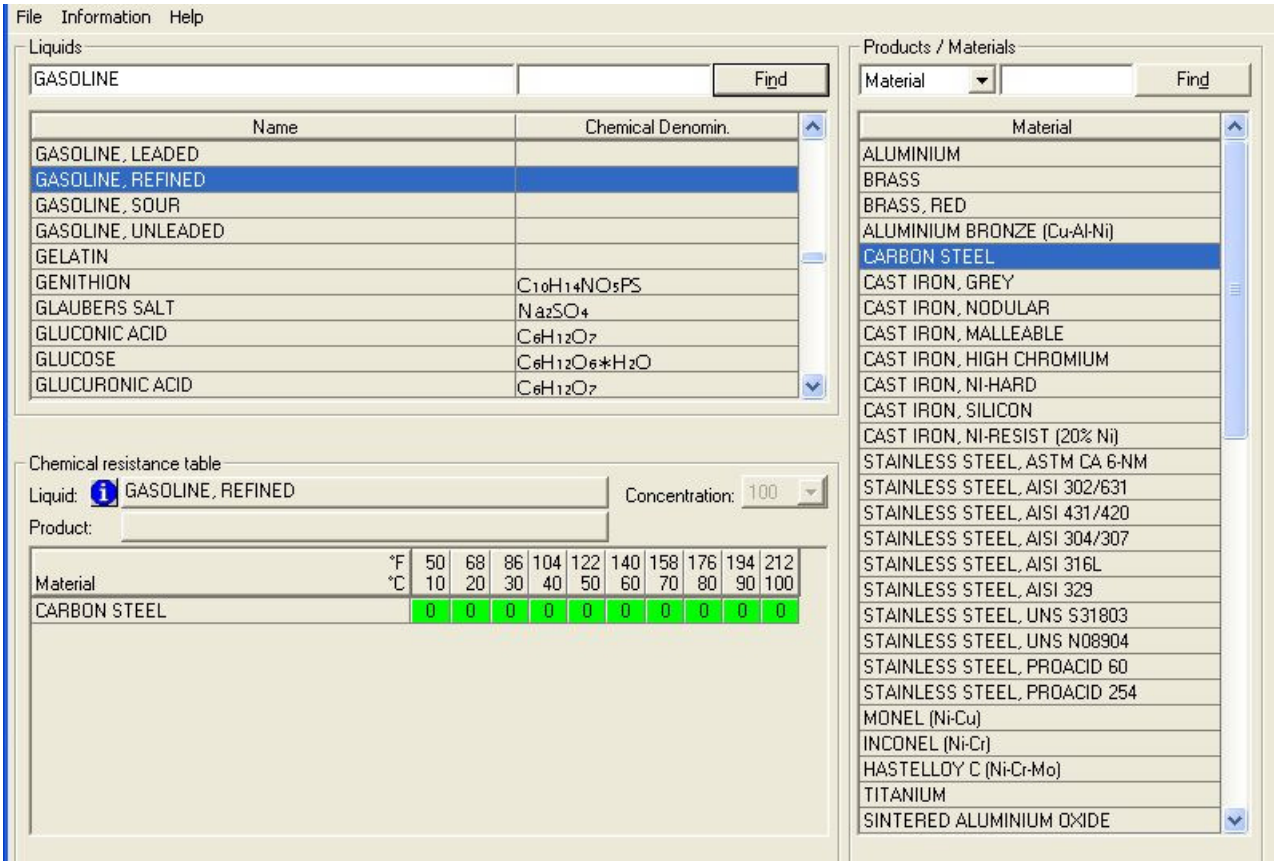
a)Se considera durata de functionare de T ani de la data de punere in functionare
b)Se calculeaza viteza medie de coroziune anuala cu relatia:

Vm = (Si-Som)/T , unde
Si – grosimea initiala a tablei ; Som – grosimea minima masurata.

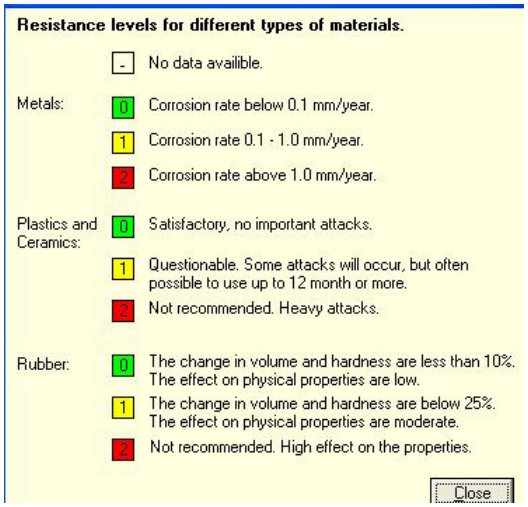
c) Deoarece viteza de coroziune nu este o functie liniara , se determina durata remanenta de viata cu relatia:

$$T_{REM} = = (Sir-Som)/(Vm*Ko)$$, [ani]

unde **Ko = 1.5** un coeficiet care tine cont de corozivitatea mediului.
Sir = grosimea minima de rezistenta calculata
Durata remanenta de viata va fi valoarea minima determinata pe elemente.In cazul in care se considera neeconomica durata de viata determinata se poate alege inlocuirea celor mai restrictive elemente.
In lipsa documentelor din care sa cunoastem grosimea initiala a mantalei rezervorului si a unei monitorizari periodice a evolutiei in timp a grosimii elementelor utilajului se va proceda la utilizarea unei viteze de coroziune specifice fluidului de lucru, indicate de literatura de specialitate.Pentru acest lucru sa utilizat un program specializat asa cum este prezentat in continuare.



Estimarea vitezelor de coroziune este indicata mai jos.



Viteza de coroziune pentru acest rezervor este de 0,15mm/an datorita prezentei apei sarate.Estimarea duratei remanente de viata se poate face raportindu-ne la grosimea calculata conform API 650 sau grosimea adoptata conform API 650 si grosimea masurata.

Recomandari API650

Grosime minima conform API650 pentru corp –min.6mm, conform cap 5.6.1.1, diametru >15m

Grosime minima conform API650 pentru capac–min.5mm conform cap 5.10.2.2

Grosime minima conform API650 pentru racorduri –conform tab.5.6ª

Grosimea minima calculata este la limita de utilizare , adica fara adaosul de coroziune.

Rezultatele analizei se regasesc in tabelul de mai jos:

Tab.1

	Elemente calculate/masurate	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**
CORP	Grosimi minime de rezistenta calculate conform API 650 [mm]	8.1	6.9	6.0	4.9	3.9	2.8	1.8
	Grosimi minime masurate [mm]	9.0	8.0	7.0	6.4	5.3	5.2	4.1
	Adaosul de grosime peste grosimea minima calculata [mm]	***0.9***	***1.1***	***1.0***	***1.5***	***1.2***	***2.4***	***2.3***
	Durata de viata remanenta estimata in raport cu grosimea calculata (ani)	6	7	7	10	8	16	15

Tab.1 CONTINUARE

	Elemente calculate/masurate	S8	BOTTOM PLATE	ANNULAR	COLUMN	ROOF
CORP	Grosimi minime de rezistenta calculate conform API 650 [mm]	0.8	8	8	-	5
	Grosimi minime masurate [mm]	4.0	4.8	6.8	10.8	3.5
	Adaosul de grosime peste grosimea minima calculata[mm]	***2.0***	***-3.2***	***-1.2***	***-***	***-1.5***
	Durata de viata remanenta estimata in raport cu grosimea calculata (ani)	14	**0**	**0**	**-**	**0**

Tab.2

	Elemente calculate/masurate	R7	R8	R9	R10	R11
RACORD	Grosimi minime de rezistenta [mm] , conf API	12.7	12.7	8.56	12.7	12.7
	Grosimi minime masurate [mm]	9.5	7.0	6.1	5.4	7.2
	Adaosul de grosime peste grosimea minima masurata [mm]	**-2.2**	**-2.7**	**-2.5**	**-6.3**	**-5.3**
	Durata de viata remanenta estimata [ani](conf.API650)	**0**	**0**	**0**	**0**	**0**

Tab.2 Continuare

	Elemente calculate/masurate	GV.I	GV.2	ROOF RING
RACORD	Grosimi minime de rezistenta [mm] , conf API	12.7	12.7	-
	Grosimi minime masurate [mm]	10.0	10.1	7.9
	Adaosul de grosime peste grosimea minima masurata [mm]	**-2.7**	**-2.6**	-
	Durata de viata remanenta estimata [ani](conf.API650)	0	0	-

CONCLUZII:

- Estimind in raport cu grosimile de rezistenta rezervorul(cu exceptia racordurilor) se poate utiliza max.6 ani cu conditia monitorizarii anuale a grosimii elementelor critice sau inlocuind aceste elemente critice .

Prepared		**Checked**	**Approved**		
Date	16.03.2012	Date	16.03.2012	Date	
Signature		Signature		Signature	

	STRENGTH CALCULATION	T-01.RV-206-00/BC
	NAME: REZ.305 , ANEXA 1	Pag.1…8

SHELL COURSE CALCULATION — Rev.

DESIGN CODE: API 650 , Ed.2007 , Add.2010 , 1-FOOT METHOD D < 61m

Operating fluid : Comercial GASOLINE

DESIGN PARAMETERS		Symbol	U.M.	Value
Tank diameter (I.D)		D	m	22.78
Design specific gravity		G		0.74
Design pressure	(atmosferic)	P	kPa	0
Operating pressure	(atmosferic)	P_L	kPa	0
Presiune de testare	(full water)	Pt	kPa	0
Design temperature		T_c	°C	<93
Maximun operating temperature		Tmax	°C	50
Minimum temperature		Tmin	°C	15
Maximum fill level		H	m	11.73
Number courses of shell		-	-	
Tank roof (type)		FIX		YES
		MOBIL		NO
		CU CAPAC MOBIL		NO
		CU GRINZI RADIALE		YES
Roof sloap		α	grd	<10
Heat insulation thk.		-	mm	-

COURSE 8		Symbol	U.M.	Value
Safety coeficients		C_1=2/3	-	0.67
		C_2=2/5	-	0.4
		C_3=3/4	-	0.75
		C_4=3/7	-	0.43
Yield strenght to T^0C	MATERIAL : OL37.4K / STAS 500-88	$R_{p\,0,2/T°}$	N/mm²	235.0
Tensile strenght to 20^0C		$R_m^{20°}$	N/mm²	363.0
Design stress to operating conditions		S_d	N/mm²	145.2
Design stress to hydrostatic test conditions		S_t	N/mm²	155.6
$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right)$ (5.6.2.2)		(2/3)$R_{p0.2}$	N/mm²	156.7
		(2/5)R_m	N/mm²	145.2
$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right)$ (5.6.2.3)		(3/4)$R_{p0.2}$	N/mm²	176.3
		(3/7)R_m	N/mm²	155.6
Height of the course		H_c	m	1.3800
Liquid Level from the bottom of the course(design conditions)		H_{ld}	m	1.08
Liquid Level from the bottom of the course(test conditions)		H_{lt}	m	1.38
Design liquid Level from the bottom of the course(design conditions)		H_d	m	1.080
Design liquid Level from the bottom of the course(test conditions)		H_t	m	1.380

$$H_d = H_{ld} + 0.1*(P/G) \qquad H_t = H_{lt} + 0.1*P_t$$

Corossion allowance	(checked condition)	CA	mm	0.00
Minimum design shell thickness (design conditions)		t_d	mm	0.44372

$$t_d = \frac{4.9D(H_d - 0.3)G}{S_d} + CA \qquad (5.6.3.2)$$

Minimum design shell thickness (test conditions)	t_t	mm	0.7749

$$t_t = \frac{4.9D(H_t - 0.3)}{S_t} \qquad (5.6.3.2)$$

Minumum design thickness acc.to API 650 , 5.6.1.1	t	mm	6.0
Nominal design thickness ; max(t_d ; t_t)	t_n	mm	0.775
Shell thickness (minimum permitted thickness)	t_a	mm	6.0

STRESS CHECKED (acc. to EN14015 , par.9.1)

Minimum measurement thickness		t_m	mm	**4.0**
Allow. Stress to operating conditions	***max.260N/mm²***	S_{dc}	N/mm²	**16.1**

$$S_{dc} = \frac{4.9D(H_d - 0.3)G}{t_d}$$

Allow. Stress to test conditions	***max.260N/mm²***	S_{tc}	N/mm²	**30.1**

$$S_{tc} = \frac{4.9D(H_t - 0.3)}{t_t}$$

COURSE 7			
Safety coeficients	C_1=2/3	-	*0.66667*
	C_2=2/5	-	*0.4*
	C_3=3/4	-	*0.75*
	C_4=3/7	-	*0.42857*
Yield strenght to T^0C **MATERIAL : OL37.4K / STAS 500-88**	$R_{p\,0,2/T°}$	N/mm²	235.0
Tensile strenght to 20^0C	$R_m^{20°}$	N/mm²	363.0
Design stress to operating conditions	S_d	N/mm²	145.2
Design stress to hydrostatic test conditions	S_t	N/mm²	155.6
$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right)$ (5.6.2.2)	*(2/3)$R_{p0.2}$*	N/mm²	156.7
	(2/5)R_m	N/mm²	145.2
$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right)$ *(5.6.2.3)*	*(3/4)$R_{p0.2}$*	N/mm²	176.3
	(3/7)R_m	N/mm²	155.6

Height of the course	H_c	*m*	*1.43*
Liquid Level from the bottom of the course(design conditions)	H_{ld}	*m*	*2.51*
Liquid Level from the bottom of the course(test conditions)	H_{lt}	*m*	*2.81*
Design liquid Level from the bottom of the course(design conditions)	H_d	*m*	*2.510*
Design liquid Level from the bottom of the course(test conditions)	H_t	*m*	*2.810*

$$H_d = H_{ld} + 0.1*(P/G) \qquad H_t = H_{lt} + 0.1*P_t$$

Corossion allowance (checked condition)	CA	*mm*	0.00
Minimum design shell thickness (design conditions)	t_d	*mm*	***1.25721***

$$t_d = \frac{4.9D(H_d - 0.3)G}{S_d} + CA \qquad (5.6.3.2)$$

Minimum design shell thickness (test conditions)	t_t	*mm*	***1.80092***

$$t_t = \frac{4.9D(H_t - 0.3)}{S_t} \qquad (5.6.3.2)$$

Minumum design thickness acc.to API 650 , 5.6.1.1	*t*	*mm*	***6.0***
Nominal design thickness ; max(t_d ; t_t)	t_n	*mm*	***1.801***
Shell thickness (minimum permitted thickness)	t_a	*mm*	**6**

STRESS CHECKED (acc. to EN14015 , par.9.1)

Minimum measurement thickness		t_m	mm	**4.1**
Allow. Stress to operating conditions	***max.260N/mm²***	S_{dc}	N/mm²	**44.5**

$$S_{dc} = \frac{4.9D(H_d - 0.3)G}{t_d}$$

Allow. Stress to test conditions	***max.260N/mm²***	S_{tc}	N/mm²	**68.3**

$$S_{tc} = \frac{4.9D(H_t - 0.3)}{t_t}$$

COURSE 6			
Safety coeficients	C_1=2/3	-	*0.66667*
	C_2=2/5	-	*0.4*
	C_3=3/4	-	*0.75*

		C_4=3/7	-	0.42857
Yield strenght to T^0C	**MATERIAL : OL37.4K / STAS 500-88**	$R_{p\,0,2/T°}$	N/mm²	235.0
Tensile strenght to 20^0C		$R_m^{20°}$	N/mm²	363.0
Design stress to operating conditions		S_d	N/mm²	145.2
Design stress to hydrostatic test conditions		S_t	N/mm²	155.6
$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right)$ (5.6.2.2)		(2/3)$R_{p0.2}$	N/mm²	156.7
		(2/5)R_m	N/mm²	145.2
		(3/4)$R_{p0.2}$	N/mm²	176.3
$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right)$ (5.6.2.3)		(3/7)R_m	N/mm²	155.6
Height of the course		H_c	m	1.51
Liquid Level from the bottom of the course(design conditions)		H_{ld}	m	4.02
Liquid Level from the bottom of the course(test conditions)		H_{lt}	m	4.32
Design liquid Level from the bottom of the course(design conditions)		H_d	m	4.020
Design liquid Level from the bottom of the course(test conditions)		H_t	m	4.320
$H_d = H_{ld} + 0.1*(P/G)$		$H_t = H_{lt} + 0.1*P_t$		
Corossion allowance (checked condition)		CA	mm	0.00
Minimum design shell thickness (design conditions)		t_d	mm	**2.11621**
$t_d = \frac{4.9D(H_d - 0.3)G}{S_d} + CA$ (5.6.3.2)				
Minimum design shell thickness (test conditions)		t_t	mm	**2.88434**
$t_t = \frac{4.9D(H_t - 0.3)}{S_t}$ (5.6.3.2)				
Minumum design thickness acc.to API 650 , 5.6.1.1		t	mm	**6.0**
Nominal design thickness ; max(t_d ; t_t)		t_n	mm	**2.884**
Shell thickness (minimum permitted thickness)		t_a	mm	**6**
STRESS CHECKED (acc. to EN14015 , par.9.1)				
Minimum measurement thickness		t_m	mm	**5.2**
Allow. Stress to operating conditions	***max.260N/mm²***	S_{dc}	N/mm²	59.1
$S_{dc} = \frac{4.9D(H_d - 0.3)G}{t_d}$				
Allow. Stress to test conditions	***max.260N/mm²***	S_{tc}	N/mm²	86.3
$S_{tc} = \frac{4.9D(H_t - 0.3)}{t_t}$				
COURSE 5				
Safety coeficients		C 1=2/3	-	0.66667
		C_2=2/5	-	0.4
		C_3=3/4	-	0.75
		C_4=3/7	-	0.42857
Yield strenght to T^0C	**MATERIAL : OL37.4K / STAS 500-88**	$R_{p\,0,2/T°}$	N/mm²	235.0
Tensile strenght to 20^0C		$R_m^{20°}$	N/mm²	363.0
Design stress to operating conditions		S_d	N/mm²	145.2
Design stress to hydrostatic test conditions		S_t	N/mm²	155.6
$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right)$ (5.6.2.2)		(2/3)$R_{p0.2}$	N/mm²	156.7
		(2/5)R_m	N/mm²	145.2
		(3/4)$R_{p0.2}$	N/mm²	176.3
$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right)$ (5.6.2.3)		(3/7)R_m	N/mm²	155.6
Height of the course		H_c	m	1.43

Liquid Level from the bottom of the course(design conditions)	H_{ld}	*m*	*5.45*
Liquid Level from the bottom of the course(test conditions)	H_{lt}	*m*	*5.75*
Design liquid Level from the bottom of the course(design conditions)	H_d	*m*	*5.450*
Design liquid Level from the bottom of the course(test conditions)	H_t	*m*	*5.750*

$$H_d = H_{ld} + 0.1*(P/G) \qquad H_t = H_{lt} + 0.1*P_t$$

Corossion allowance (checked condition)	CA	*mm*	0.00
Minimum design shell thickness (design conditions)	t_d	*mm*	***2.92969***

$$t_d = \frac{4.9D(H_d - 0.3)G}{S_d} + CA \qquad (5.6.3.2)$$

Minimum design shell thickness (test conditions)	t_t	*mm*	***3.91036***

$$t_t = \frac{4.9D(H_t - 0.3)}{S_t} \qquad (5.6.3.2)$$

Minumum design thickness acc.to API 650 , 5.6.1.1	*t*	*mm*	***6.0***
Nominal design thickness ; max(t_d ; t_t)	t_n	*mm*	***3.910***
Shell thickness (minimum permitted thickness)	t_a	*mm*	**6**

STRESS CHECKED (acc. to EN14015 , par.9.1)

Minimum measurement thickness	t_m	*mm*	**5.3**
Allow. Stress to operating conditions ***max.260N/mm²***	***S_{dc}***	***N/mm²***	**80.3**

$$S_{dc} = \frac{4.9D(H_d - 0.3)G}{t_d}$$

Allow. Stress to test conditions ***max.260N/mm²***	***S_{tc}***	***N/mm²***	**114.8**

$$S_{tc} = \frac{4.9D(H_t - 0.3)}{t_t}$$

COURSE 4			
Safety coeficients	*C* 1=2/3	-	*0.66667*
	C_2=2/5	-	*0.4*
	C_3=3/4	-	*0.75*
	C_4=3/7	-	*0.42857*
Yield strenght to T^0C **MATERIAL : OL37.4K / STAS 500-88**	$R_{p\,0,2/T°}$	*N/mm²*	235.0
Tensile strenght to 20^0C	$R_m^{20°}$	*N/mm²*	363.0
Design stress to operating conditions	S_d	*N/mm²*	145.2
Design stress to hydrostatic test conditions	S_t	*N/mm²*	155.6
	(2/3)$R_{p0.2}$	*N/mm²*	156.7
	(2/5)R_m	*N/mm²*	145.2
	(3/4)$R_{p0.2}$	*N/mm²*	176.3
	(3/7)R_m	*N/mm²*	155.6

$$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right) \qquad (5.6.2.2)$$

$$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right) \qquad (5.6.2.3)$$

Height of the course	H_c	*m*	*1.50*
Liquid Level from the bottom of the course(design conditions)	H_{ld}	*m*	*6.95*
Liquid Level from the bottom of the course(test conditions)	H_{lt}	*m*	*7.25*
Design liquid Level from the bottom of the course(design conditions)	H_d	*m*	*6.950*
Design liquid Level from the bottom of the course(test conditions)	H_t	*m*	*7.250*

$$H_d = H_{ld} + 0.1*(P/G) \qquad H_t = H_{lt} + 0.1*P_t$$

Corossion allowance (checked condition)	CA	*mm*	0.00
Minimum design shell thickness (design conditions)	t_d	*mm*	***3.783***

$$t_d = \frac{4.9D(H_d - 0.3)G}{S_d} + CA \qquad (5.6.3.2)$$

Minimum design shell thickness (test conditions)	t_t	*mm*	***4.9866***

$$t_t = \frac{4.9D(H_t - 0.3)}{S_t} \qquad (5.6.3.2)$$

Minumum design thickness acc.to API 650 , 5.6.1.1	t	*mm*	***6.0***
Nominal design thickness ; max(t_d ; t_t)	t_n	*mm*	***4.987***
Shell thickness (minimum permitted thickness)	t_a	*mm*	**6**

STRESS CHECKED (acc. to EN14015 , par.9.1)

Minimum measurement thickness		t_m	*mm*	**6.4**
Allow. Stress to operating conditions	***max.260N/mm²***	S_{dc}	***N/mm²***	**85.8**

$$S_{dc} = \frac{4.9D(H_d - 0.3)G}{t_d}$$

Allow. Stress to test conditions	***max.260N/mm²***	S_{tc}	***N/mm²***	**121.2**

$$S_{tc} = \frac{4.9D(H_t - 0.3)}{t_t}$$

COURSE3

Safety coeficients		C_1=2/3	-	*0.67*
		C_2=2/5	-	*0.4*
		C_3=3/4	-	*0.75*
		C_4=3/7	-	*0.43*
Yield strenght to T^0C	**MATERIAL : OL37.4.2K / STAS 500-88**	$R_{p\,0,2/T°}$	*N/mm²*	235.0
Tensile strenght to 20^0C		$R_m^{20°}$	*N/mm²*	363.0
Design stress to operating conditions		S_d	*N/mm²*	145.2
Design stress to hydrostatic test conditions		S_t	*N/mm²*	155.6
		(2/3)$R_{p0.2}$	*N/mm²*	156.7
		(2/5)R_m	*N/mm²*	145.2
		(3/4)$R_{p0.2}$	*N/mm²*	176.3
		(3/7)R_m	*N/mm²*	155.6

$$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right) \qquad (5.6.2.2)$$

$$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right) \qquad (5.6.2.3)$$

Height of the course	H_c	*m*	*1.48*
Liquid Level from the bottom of the course(design conditions)	H_{ld}	*m*	*8.43*
Liquid Level from the bottom of the course(test conditions)	H_{lt}	*m*	*8.73*
Design liquid Level from the bottom of the course(design conditions)	H_d	*m*	*8.430*
Design liquid Level from the bottom of the course(test conditions)	H_t	*m*	*8.730*

$$H_d = H_{ld} + 0.1*(P/G) \qquad H_t = H_{lt} + 0.1*P_t$$

Corossion allowance (checked condition)	CA	*mm*	0.00
Minimum design shell thickness (design conditions)	t_d	*mm*	***4.62493***

$$t_d = \frac{4.9D(H_d - 0.3)G}{S_d} + CA \qquad (5.6.3.2)$$

Minimum design shell thickness (test conditions)	t_t	*mm*	***6.0485***

$$t_t = \frac{4.9D(H_t - 0.3)}{S_t} \qquad (5.6.3.2)$$

Minumum design thickness acc.to API 650 , 5.6.1.1	t	*mm*	***6.0***
Nominal design thickness ; max(t_d ; t_t)	t_n	*mm*	***6.048***
Shell thickness (minimum permitted thickness)	t_a	*mm*	**8**

STRESS CHECKED (acc. to EN14015 , par.9.1)

Minimum measurement thickness		t_m	*mm*	**7.0**
Allow. Stress to operating conditions	***max.260N/mm²***	S_{dc}	***N/mm²***	**95.9**

$$S_{dc} = \frac{4.9D(H_d - 0.3)G}{t_d}$$

Allow. Stress to test conditions	***max.260N/mm²***	S_{tc}	***N/mm²***	**134.4**

$$S_{tc} = \frac{4.9D(H_t - 0.3)}{t_t}$$

t_t

COURSE2				
Safety coeficients		C_1=2/3	-	0.67
		C_2=2/5	-	0.4
		C_3=3/4	-	0.75
		C_4=3/7	-	0.43
Yield strenght to T^0C	MATERIAL : OL37.4K / STAS 500-88	$R_{p\,0,2/T°}$	N/mm²	235.0
Tensile strenght to 20^0C		$R_m^{20°}$	N/mm²	363.0
Design stress to operating conditions		S_d	N/mm²	145.2
Design stress to hydrostatic test conditions		S_t	N/mm²	155.6
$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right)$ (5.6.2.2)		(2/3)$R_{p0.2}$	N/mm²	156.7
		(2/5)R_m	N/mm²	145.2
		(3/4)$R_{p0.2}$	N/mm²	176.3
$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right)$ (5.6.2.3)		(3/7)R_m	N/mm²	155.6
Height of the course		H_c	m	1.50
Liquid Level from the bottom of the course(design conditions)		H_{ld}	m	9.93
Liquid Level from the bottom of the course(test conditions)		H_{lt}	m	10.23
Design liquid Level from the bottom of the course(design conditions)		H_d	m	10.042
Design liquid Level from the bottom of the course(test conditions)		H_t	m	10.511
$H_d = H_{ld} + 0.1*(P/G)$ $\quad H_t = H_{lt} + 0.1*P_t$				
Corossion allowance (checked condition)		CA	mm	
Minimum design shell thickness (design conditions)		t_d	mm	**5.47824**
$t_d = \frac{4.9D(H_d - 0.3)G}{S_d} + CA$ (5.6.3.2)				
Minimum design shell thickness (test conditions)		t_t	mm	**6.90949**
$t_t = \frac{4.9D(H_t - 0.3)}{S_t}$ (5.6.3.2)				
Minumum design thickness acc.to API 650 , 5.6.1.1		t	mm	**6.0**
Nominal design thickness ; max(t_d ; t_t)		t_n	mm	**6.909**
Shell thickness (minimum permitted thickness)		t_a	mm	**8**
STRESS CHECKED (acc. to EN14015 , par.9.1)				
Minimum measurement thickness		t_m	mm	**8.0**
Allow. Stress to operating conditions	***max.260N/mm²***	S_{dc}	N/mm²	**100.6**
$S_{dc} = \frac{4.9D(H_d - 0.3)G}{t_d}$				
Allow. Stress to test conditions	***max.260N/mm²***	S_{tc}	N/mm²	**142.5**
$S_{tc} = \frac{4.9D(H_t - 0.3)}{t_t}$				

COURSE1				
Safety coeficients		C_1=2/3	-	0.67
		C_2=2/5	-	0.4
		C_3=3/4	-	0.75
		C_4=3/7	-	0.43
Yield strenght to T^0C	MATERIAL : OL37.4K / STAS 500-88	$R_{p\,0,2/T°}$	N/mm²	235.0
Tensile strenght to 20^0C		$R_m^{20°}$	N/mm²	363.0
Design stress to operating conditions		S_d	N/mm²	145.2
Design stress to hydrostatic test conditions		S_t	N/mm²	155.6
$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right)$ (5.6.2.2)		(2/3)$R_{p0.2}$	N/mm²	156.7
		(2/5)R_m	N/mm²	145.2
		(3/4)$R_{p0.2}$	N/mm²	176.3

$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right)$ (5.6.2.3)	(3/7)R_m	N/mm²	155.6
Height of the course	H_c	*m*	*1.49*
Liquid Level from the bottom of the course(design conditions)	H_{ld}	*m*	*11.42*
Liquid Level from the bottom of the course(test conditions)	H_{lt}	*m*	*11.72*
Design liquid Level from the bottom of the course(design conditions)	H_d	*m*	*11.686*
Design liquid Level from the bottom of the course(test conditions)	H_t	*m*	*11.720*

$$H_d = H_{ld} + 0.1*(P/G) \qquad H_t = H_{lt} + 0.1*P_t$$

Corossion allowance (checked condition)	CA	*mm*	0.00
Minimum design shell thickness (design conditions)	t_d	*mm*	***6.47731***

$$t_d = \frac{4.9D(H_d - 0.3)G}{S_d} + CA \qquad (5.6.3.2)$$

Minimum design shell thickness (test conditions)	t_t	*mm*	***8.19381***

$$t_t = \frac{4.9D(H_t - 0.3)}{S_t} \qquad (5.6.3.2)$$

Minumum design thickness acc.to API 650 , 5.6.1.1	*t*	*mm*	***6.0***
Nominal design thickness ; max(t_d ; t_t)	t_n	*mm*	***8.194***
Shell thickness (minimum permitted thickness)	t_a	*mm*	**10**

STRESS CHECKED (acc. to EN14015 , par.9.1)

Minimum measurement thickness		t_m	*mm*	**9.0**
Allow. Stress to operating conditions	***max.260N/mm²***	S_{dc}	*N/mm²*	**104.5**

$$S_{dc} = \frac{4.9D(H_d - 0.3)G}{t_d}$$

Allow. Stress to test conditions	***max.260N/mm²***	S_{tc}	*N/mm²*	**141.6**

$$S_{tc} = \frac{4.9D(H_t - 0.3)}{t_t}$$

BOTTOM PLATE THICKNESS — Rev.

API 650 , Ed.2007 , Add.2010 , 1-FOOT METHOD D < 61m

Operating fluid : Comercial GASOLINE

PARAMETRII DE PROIECTARE		Simbol	U.M.	Valoare
Tank diameter (I.D)		**D**	m	**22.78**
Design specific gravity		G		0.74
Design pressure	(atmosferic)	P	kPa	0
Operating pressure	(atmosferic)	P_L	kPa	0
Presiune de testare	(full water)	Pt	kPa	0
Design temperature		T_c	°C	<93
Maximun operating temperature		Tmax	°C	50
Minimum temperature		Tmin	°C	15
Maximum fill level		H	m	11.73
Safety coeficients		C_1=2/3	-	0.67
		C_2=2/5	-	0.4
		C_3=3/4	-	0.75
		C_4=3/7	-	0.43
Yield strenght to T^0C	MATERIAL : OL37.4K / STAS 500-88	$R_{p\,0,2/T°}$	N/mm²	235.0
Tensile strenght to 20^0C		$R_m^{20°}$	N/mm²	363.0
Design stress to operating conditions		S_d	N/mm²	145.2
Design stress to hydrostatic test conditions		S_t	N/mm²	155.6
$S_d = \min\left(\frac{2}{3}R_{p0.2}; \frac{2}{5}R_m\right)$	(5.6.2.2)	(2/3)$R_{p0.2}$	N/mm²	156.7
		(2/5)R_m	N/mm²	145.2
		(3/4)$R_{p0.2}$	N/mm²	176.3
$S_t = \min\left(\frac{3}{4}R_{p0.2}; \frac{3}{7}R_m\right)$	(5.6.2.3)	(3/7)R_m	N/mm²	155.6
Corossion allowance	(checked condition)	CA	mm	0.0
Bottom plate thickness				
Minim. design thickness (design cond.), acc to API 650-5.4.1		tmin	mm	8
Minimum necessary thickness $t_n = t_{min} + CA$		tn	mm	8.0
Bottom plate thickness(minim adopted)		t	mm	8
Annular bottom plate thickness				
Thickness of bottom shell course		t1	mm	10
Minimum thickness acc. to API 650 , Tab.5-1a		ta	mm	8
Minimum necessary thickness $t_{an}=t_a+CA$		tan	mm	8.0
Annular bottom plate thickness (final adopted)		t	mm	8
Radial width of the annular plate between the inside of the shell				
Lateral acceleration coeficient		A	%g	0.08
Vertical earthquake acceleration coeficient ; Av=0.7A		Av	%g	0.056
Design specific gravity , API 650 , E.2.2		Ge	-	0.72342

Ge = G(1-0.4Av)

Radial width conditions

1.) L>600mm

2.) $L > \frac{215 t_a}{\sqrt{HG}}$ (5.5.2) — L> — mm — 583.799

3) $L > 0.01723 t_a \sqrt{\frac{R_{p0.2}^{20}}{GeH}}$ E.6.2.1.1.2-1a — L> — m — 0.72538

4.) L< 0.035*D — L< — m — 0.7973

Latimea radiala minima adoptata	L	m	1000

Earthquake acceleration value in acc. to seismin map of Romanian country and seismic code of Romanian country P100-2006