

Tanks Emissions Software

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Abstract

The management of the volatile hydrocarbon and of the dangerous chemical substances (BTX) takes into consideration, on one hand, the storing under maximum security and safety conditions, and on the other hand the identification of the volatile losses of stored substances, limiting these emissions through measures taken according to the national and international safety and environmental standards. In order to monitor these emissions, given also the high volume of information necessary for an analytical approach, the soft called Tanks Emissions Software allows to obtain results in a very short time and issues a series of reports according to the requirements and according to the environment law.

Key words: vapour control, hydrocarbon emissions, storage tanks

Introduction

This program – Tanks Emissions Software – is dedicated to the estimation of losses of petroleum products from the vertical cylindrical tanks with fixed roof and to the estimation of losses of petroleum products from the vertical cylindrical tanks with fixed roof and floating roof, [1, 3, 4].

The program allows the introduction of specific information on: a storage tank (size, construction, condition of paint), the stored liquid (type of product), the location of the tank (temperatures of the environment, average atmospheric pressure, average speed of the wind in the located perimeter), annual loading-unloading rate of the tank and it generates reports on the atmospheric losses .

The reports include estimations, for one year or for certain periods of the year, on the losses for each type of product stored in the tank.

The equations for the estimation of losses from tanks used by this program (Tanks Emissions Software) are determined according to API 2518 and API 2519.

Premises of the Program: Tanks Emissions Software

- For a more accurate calculation, the program takes into account the specific meteorological data: temperature of the environment, medium atmospheric pressure, average wind speed in the located perimeter;
- The program calculates automatically the loss factor for the fittings, based on the data introduced by the user;

- There is a database of liquid petroleum products for which the program allows the calculation of losses;
- It allows the continuous development of the database by introducing different data for companies/clients, locations and types of tanks;
- It makes calculations for the entire year or for certain periods of time, for any petroleum product or chemical mixture in the database.



Fig. 1. Start page – Home.

How to Use the Program: Tanks Emissions Software. Data to Be Introduced for the Tanks.

- Data regarding the tank: identification, construction, physical characteristics;
- Data regarding the mounting of the roof: only for the tanks with floating screen;
- Data regarding the location of the tank: meteorological conditions (temperature, atmospheric pressure, wind speed);
- Data regarding the stored product: the chemical compounds and the properties of the product must be determined so that the program can calculate the vapor pressure of the stored product.

Two constructive types of tanks are introduced, [2, 3]:

- Vertical cylindrical tank with fixed roof;
- Vertical cylindrical tank with fixed roof and internal floating roof.



Fig. 2. Types of tanks.

The Case when We Have a Vertical Cylindrical Tank with Fixed Roof

Table 1. Particularities on the LOCATION. Data to be introduced:

Company ⇒	Add the company
Perimeter ⇒	Add Perimeter
	Edit
Section ⇒	Add the section
	Edit
Park ⇒	Add the park
	Edit
Select the type of Tank ⇒	Add vertical cylindrical tank with fixed roof
	Add vertical cylindrical tank with fixed roof and internal floating roof

Table 2. Particularities on the TANK. Data to be introduced:

Tank code ⇒	The value must be introduced [m]
Tank diameter ⇒	The value must be introduced [m]
Tank height ⇒	The value must be introduced [m]
Cargo deadweight ⇒ (filling capacity)	The value must be introduced [m ³]
Preselection Roof and shell color ⇒	It must be chosen from the ones listed in the program
Preselection ⇒ Paint quality	It must be chosen from the ones listed in the program

Comments: After **Data editing**, you must press: **Send data**, and then press **Calculus**, corresponding to the predefined tank.

Calcul emisii RCV

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Editare rezervor

Societati->OMV Petrom S.A. - Petrobrazi->Carou 13->Carou 13->Parc 8->574A

Societatea	OMV Petrom S.A. - Petrobrazi
Perimetrul	Carou 13
Sectia	Carou 13
Parcul	Parc 8
Tip rezervor	RCV cu capac fix
Cod rezervor	574A
Diametru rezervor	6.62
Inaltime rezervor	6.87
Capacitate utilă rezervor	235
Culori capac și corp	CAPAC: Gri închis și CORP: Gri închis
Calitate vopsea	Rea

Trimite date

Fig. 3. Exemplification, Editing tank 574A that stores phenyl methane.

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Calcul emisii rezervor

Societati->OMV Petrom S.A. - Petrobrazi->Carou 13->Carou 13->Parc 8->574E

An	Operatii	Pierderi [kg/an]		
		prin respirație	de lucru	total
+ Adaugă an				

Fig. 4. Selecting the year for which the loss is estimated.

Table 3. The following fields must be filled in accordingly:

Average temperature of the environment ⇒	The value must be introduced [°C]
Maximal temperature of the environment ⇒	The value must be introduced [°C]
Minimal temperature of the environment ⇒	The value must be introduced [°C]
Average atmospheric pressure ⇒	The value must be introduced [mm Hg]
The volume of product pumped into the tank ⇒ (the yearly throughput)	The value must be introduced [m ³]
Number of unloadings	It is calculated by the program as the report: [Volume of product pumped into the tank] / [Filling volume of the tank]

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Esenta miscarii PETROM

Editare emisii rezervor pentru anul selectat

Societati -> OMV Petrom S.A. - Petrobrazi -> Carou 13 -> Carou 13 -> Parc 8 -> 574A

Produsul din rezervor	Toluen
Anul	2009
Temperatura medie a mediului ambient (°C)	20
Temperatura maxima a mediului ambient (°C)	25
Temperatura minima a mediului ambient (°C)	5
Presiunea medie atmosferica (mmHg)	760
Voluam pompat din rezervor (m ³)	3588
Numar goliri anuale	15.2681

Trimite date

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Fig. 5. Editing the parameters for the estimation, example for Vertical cylindrical tank 574A

Comments: After **Editing data**, you must press: **Send data**, after which the evaporation losses are automatically calculated for the predefined tank.

Calcul emisii RCV

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Calcul emisii rezervor

Societati -> OMV Petrom S.A. - Petrobrazi -> Carou 13 -> Carou 13 -> Parc 8 -> 574A

An	Operatii	Pierderi [kg/an]		
		prin respiratie	de lucru	total
2009	✎ ✕	561.067	385.642	946.709
Adauga an				

Fig. 6. Calculus of evaporation losses for Vertical Cylindrical tank 574A [kg/an].

Comments: A report can be issued by pressing the icon Adobe Acrobat

Raport emisii: 574A
RCV cu capac fix

Rezervor: 574A

Societate	OMV Petrom S.A. - Petrobrazi
Perimetru	Carou 13
Secția	Carou 13
Parc	Parc 8

Caracteristici constructive

Tip rezervor	RCV cu capac fix
Diametru	6.62 [m]
Înălțime	6.87 [m]
Capacitate utilă rezervor	235 [m ³]
Culori capac și corp	CAPAC: Gri închis și CORP: Gri închis
Calitate vopsea	Rea

Parametri de exploatare

Anul de calcul al emisiilor	2009
Produs	Toluen
Temperatura medie a mediului ambiant	20 [°C]
Temperatura maximă a mediului ambiant	25 [°C]
Temperatura minimă a mediului ambiant	5 [°C]
Presiunea medie atmosferică	760 [mm Hg]
Voluim pompat din rezervor	3588 [m ³]
Număr goliri anuale	15.2681

Rezultate emisii pe anul 2009

Pierderi prin respirație	561.067 [kg/an]
Pierderi de lucru	385.642 [kg/an]
Pierderi totale	946.709 [kg/an]

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Fig. 7. The report issued for the Tank 574A.

The Case when We Have a Vertical Cylindrical Tank with Fixed Roof and Internal Floating Roof

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Societatea	OMV Petrom S.A. - Petrobrazi
Perimetrul	Carou 13
Secția	Carou 13
Parcul	Parc 8
Tip rezervor	RCV cu capac fix si ecran plutitor
Cod rezervor	574A_ecran plutitor
Diametru rezervor	6.62
Înălțime rezervor	6.84
Capacitate utilă rezervor	235
Starea peretelui	Rugină puternică
Tip platforma	Sudată
Culori capac si corp	CAPAC: Gri închis și CORP: Gri închis
Diametru stalp sustinere	nu se cunoaste
Tipul etansarii	Etansare flexibila montata pe inel lichid

Fig. 8. Exemplification, Editing the vertical cylindrical tank with internal floating roof 574A that stores phenyl methane.

Calcul emisii RCV

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Editare emisii rezervor pentru anul selectat

Societati -> OMV Petrom S.A. - Petrobrazi -> Carou 13 -> Carou 13 -> Parc 8 -> 574A_ecran plutitor

Produsul din rezervor	Toluen
Anul	2009
Temperatura medie a mediului ambient (°C)	20
Temperatura maximă a mediului ambient (°C)	25
Temperatura minimă a mediului ambient (°C)	5
Densitatea lichidului la temperatura de depozitare	876
Presiunea medie atmosferică (mmHg)	760
Volum pompat din rezervor (m ³)	3589
Număr goliri anuale	15.2723

Trimite date

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Fig. 9. Editing the parameters for the calculation, exemplification for the vertical cylindrical tank with internal floating roof 574A.

Esenta mișcării **PETROM** Raport emisii: 574A_ecran plutitor
RCV cu capac fix si ecran plutitor

Rezervor: 574A_ecran plutitor

Societate	OMV Petrom S.A. - Petrobrazi
Perimetru	Carou 13
Secția	Carou 13
Parc	Parc 8

Caracteristici constructive

Tip rezervor	RCV cu capac fix si ecran plutitor
Diametru	6.62 [m]
Înălțime	6.84 [m]
Capacitate utilă rezervor	235 [m ³]
Culori capac și corp	CAPAC: Gri închis și CORP: Gri închis
Starea peretelui	Rugină puternică
Tip platformă	Sudată
Diametru stâlp susținere	nu se cunoaste
Tipul etanșării	Etansare flexibila montata pe inel lichid numai etansare primara

Parametri de exploatare

Anul de calcul al emisiilor	2009
Produs	Toluen
Temperatura medie a mediului ambient	20 [°C]
Temperatura maximă a mediului ambient	25 [°C]
Temperatura minimă a mediului ambient	5 [°C]
Densitatea lichidului la temperatură de depozitare	876 [Kg/m ³]
Presiunea medie atmosferică	760 [mm Hg]
Volum pompat din rezervor	3589 [m ³]
Număr goliri anuale	15.2723

Rezultate emisii pe anul 2009

Pierderi la dispozitivul circular de etanșare	19.0471 [kg/an]
Pierderi de lucru	28.0846 [kg/an]
Pierderi pe la fittinguri	53.3772 [kg/an]
Pierderi totale	100.509 [kg/an]

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Fig. 10. The report issued for the tank with internal floating roof.

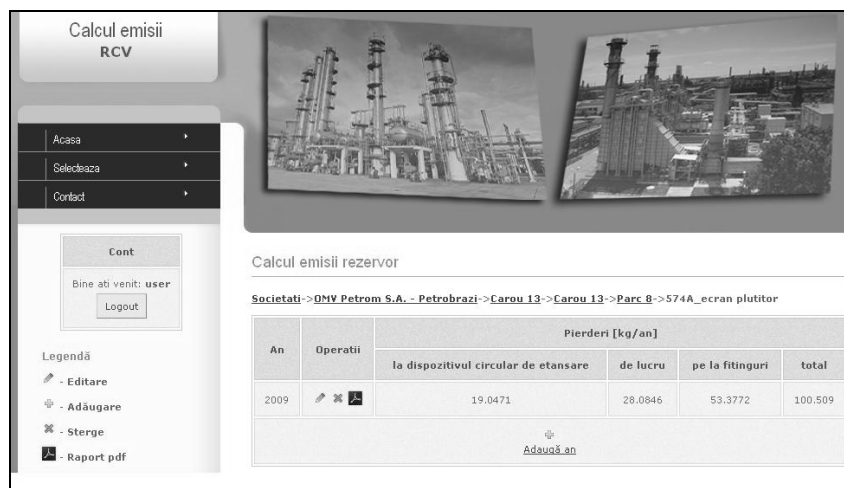


Fig. 11. Estimation of evaporation losses when an internal floating roof is mounted.

Conclusions

- Deleting an entity like *company* will delete in chain all the elements related to this entity. This is valid as well for the entities *perimeter*, *section*, *park* and *tank*. Also, all the *emission calculations* of a tank located in a certain area that is deleted will be lost, [1].
- In order to avoid calculation errors, it must be checked if all the data are introduced both in the form related to the introducing of a tank as well as in the form for the data necessary for the estimation of losses. This is called the validation of data.

References

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2. API RP-520: *Sizing, Selection and Installation of Pressure Relieving Devices in Refineries.*
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Program de calcul al emisiilor din rezervoarele de depozitare atmosferică

Rezumat

Managementul hidrocarburilor volatile și a substanțelor chimice periculoase (BTX) ia în considerație, pe de o parte, depozitarea în condiții de maximă siguranță și securitate, iar pe de altă parte identificarea pierderilor volatile de substanțe stocate, limitând aceste emisii prin măsurile luate în concordanță cu standardele de siguranță și de mediu naționale și internaționale. Pentru a monitoriza aceste emisii, și având în vedere volumul mare de informații necesare abordării analitice, softul denumit Tanks Emissions Software, permite obținerea de rezultate într-un timp foarte scurt și elaborează o serie de rapoarte în funcție de cerințele impuse, în conformitate cu legislația de mediu.