Data on greenhouse gases emission in condensate separation unit of a petrochemical company in Iran

Mehdi Ahmadi\textsuperscript{a,b}, Mehrshad Dastorian\textsuperscript{c}, Nemat Jafarzadeh\textsuperscript{a,b}, Sahand Jorfi\textsuperscript{a,b}, Bahman Ramavandi\textsuperscript{d,}\textsuperscript{*}

\textsuperscript{a} Environmental Technologies Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran  
\textsuperscript{b} Department of Environmental Health Engineering, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran  
\textsuperscript{c} Department of Chemical Engineering, Azad University of Mahshahr, Iran  
\textsuperscript{d} Department of Environmental Health Engineering, Bushehr University of Medical Sciences, Bushehr, Iran

\textbf{Article info}

\textbf{Article history:}  
Received 4 June 2016  
Received in revised form 16 June 2016  
Accepted 23 June 2016  
Available online 29 June 2016

\textbf{Keywords:}  
Greenhouse gas emissions  
Emission factor  
Petrochemical  
Clean Development Mechanism  
Bandar Imam Petrochemical Complex

\textbf{Abstract}

Since global warming due to greenhouse gas emissions is no respecter of geographical boundaries of countries, concerted mitigation activities such as Clean Development Mechanism (CDM), are suitable. In this mechanism, some developed countries can gain certified emission reduction credits from emission reduction actions undertaken in developing countries. Thus, the data of greenhouse gas emissions in developing countries would be informative for implementing of CDM. Herein, the data of greenhouse gas emissions of Bandar Imam Petrochemical Complex, one of the biggest petrochemical companies in the Middle East region is presented. The data was acquired using emission factor method and self-presented raw information of the Bandar Imam Petrochemical Complex. Overall, the data will be interesting for environmentalists, non-governmental organization (NGO), and developed countries to perform CDM.

© 2016 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).
Specifications Table

| Subject area      | Environmental Engineering |
|-------------------|----------------------------|
| More specific subject area | Air Pollution |
| Type of data      | Table and image            |
| How data was acquired | Collect raw data of greenhouse gas emission from an Iranian petrochemical company. Use emission factor to calculate greenhouse gases |
| Data format       | Processed, raw             |
| Experimental factors | Contribution of condensate separation unit of a Petrochemical Plant in Iran in greenhouse gas emission |
| Data source location | Mahshahr, Iran, 30°33′32″N 49°11′53″E |
| Data accessibility | Data is available with the article |

Value of the data

- This data set generally answered the question of “what is the situation of the implementation of Kyoto protocol legislations to prevent/reduce greenhouse gas emissions in companies in developing countries such as Bandar Imam Petrochemical Complex (BIPC)?”
- The data will be attractive for whom with concern about global warming such as non-governmental organization (NGO).
- The data of greenhouse gases estimation by emission factor in this article implicitly proposes that Bandar Imam Petrochemical Complex is good place for carbon trade and Clean Development Mechanism (CDM) implementation.

1. Data

Data presented here describe the greenhouse gases especially CH₄ and CO₂ emission from a petrochemical plant with condensate separation unit in Mahshahr, Iran. Two Tables and one figure are presented. Fig. 1 is depicts the geographical position of the Bandar Imam Petrochemical Complex (study zone). Table 1 shows emission of CH₄ and CO₂ and Table 2 contains the emission factors presented by different references.

2. Experimental design, materials and methods

The data of this article was obtained from Bandar Imam Petrochemical Complex (BIPC), with an area of 270 ha, which is located in the North West coast of the Persian Gulf. This petrochemical company is situated in Khuzestan province, Iran with 105 km southeast of Ahvaz city and 84 km East of Abadan and Mahshahr cities (see Fig. 1).

The estimation process of greenhouse gases emission involved three stages: In the first stage, a site survey with process flow diagram (PFD) study was done in September 2015 for analyzing components attributed in greenhouse gases emission in unit of separating gas condensate of Bandar imam petrochemical company. In the second stage, the emission factors provided by various organizations, which have been listed in Table 1, emissions for each sources was calculated by using Eq. (1):

\[ E = A \times EF \times [1 - (ER/100)] \]  

(1)
In this equation, \( E \) is the rate emission of greenhouse gas (the amount of greenhouse gas mass); \( A \) is the amount of activity; \( EF \) is an emission factor (the amount of greenhouse gas mass emitted per the amount of product produced or the rate activity); \( ER \) is the overall percentage reduction of emission that this value is considered to be zero, due to the lack of using greenhouse gas reduction systems \[1\]. Finally, the data were processed using Excel software for calculation of emission rate by formulation Eq. (1).

### Table 1
CH\textsubscript{4} and CO\textsubscript{2} emission from condensate separation unit.

| Unit                  | Greenhouse emission | References |
|-----------------------|---------------------|------------|
|                       | CO\textsubscript{2} (Tonne/day) | CH\textsubscript{4} (Tonne/day) |          |
| Flare                 | –                   | 0.25       | \[2\] |
|                       | 44.85               | 0.32       | \[3\] |
|                       | –                   | 0.05       | \[4\] |
|                       | 49.53               | –          | \[5\] |
|                       | 57.85               | –          | \[6\] |
|                       | 43.08               | 0.16       | \[7\] |
|                       | 61.12               | 0.005      | \[8\] |
|                       | 59.36               | 0.25       | \[9\] |
| Gas Heater            | –                   | 0.001      | \[10\] |
|                       | 29.43               | 0.006      | \[3\] |
|                       | –                   | 0.99       | \[3\] |
| Reboiler              | 0.15                | 1.38 \times 10^{-6} | \[11\] |
| Separators            | –                   | 0.03       | \[12\] |
| Compressor station    | 0.004               | 0.01       | \[10\] |
| Compressor turn on    | 0.03                | 0.53       | \[12\] |
| Compressor blow down  | 0.10                | 0.24       | \[12\] |
| Propane Reservoir     | 4.23                | 1.81       | \[10\] |
| Butane Reservoir      | 4.23                | 1.81       | \[10\] |
| Pentane Reservoir     | 1.88                | 0.80       | \[10\] |
| Hexane Reservoir      | 0.86                | 0.37       | \[10\] |
| Gas Valves            | –                   | 0.10       | \[10\] |
| Natural Gas combustion| 1718.05             | –          | \[13\] |
|                       | 1683.19             | –          | \[10\] |
|                       | 1683.19             | 0.03       | \[10\] |
|                       | 1725.38             | 0.03       | \[14\] |
|                       | 1686.54             | –          | \[6\] |
Acknowledgements

The authors would like to acknowledge Bandar Imam Petrochemical Company, Mahshahr, Iran for providing the raw information.

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2016.06.041.

References

[1] Mehdi Ahmadi, Maedeh Rozkhosh, Nemat-allah Jaaifarzadeh Haghhighifard, Emission evaluation of CO₂ and CH₄ gases in the selected gas pressure booster station in the Bangestan field of the National Iranian Oil Company, 1, 1, 2014, pp. 29–35.
[2] Regional Association of Oil and Natural Gas Companies in Latin America and the Caribbean (ARPEL), Guidelines for atmospheric emissions inventory methodologies in the petroleum industry. Alberta, Canada, 1998.
[3] Canadian Association of Petroleum Producers (CAPP), Calculating greenhouse gas emissions. Global climate change, voluntary challenge guide, 2003.
[4] European Environment Agency (EEA), Waste incineration, flaring in gas and oil extraction. In: emission inventory guidebook, 2006.
[5] Energy Information Administration (EIA), Documentation for emissions of greenhouse gases in the United States. Washington, D.C, USA, 2006.
[6] Intergovernmental Panel on Climate Change (IPCC), Guidelines for national greenhouse gas inventories, reference manual. Vol. 3, 1996.
[7] National Atmospheric Emissions Inventory (NAEI), The UK emission factor database, 2007.
[8] The Norwegian Oil industry Association, OLF environmental program, phase II, summary report, 1993.
[9] United Kingdom Offshore Association Limited, Brown and root environmental atmospheric emissions from UK oil and gas exploration and production facilities in the continental shelf area, 1993.
[10] American Petroleum Institute (API), Compendium of greenhouse gas emissions estimation methodologies for the oil and gas industry, 2009.
[11] Montana Department of Environmental Quality (MDEQ), Air resources management bureau, natural gas compressor stations greenhouse gas applicability example sample calculation problems. Air resources management bureau, 2011.
[12] California Energy Commission (CEC) Inventory of California greenhouse gas emission and sinks: 1990 to 2004, 2006.
[13] Australian National Greenhouse Accounts, National greenhouse accounts factors, 2014.
[14] U.S. Environmental Protection Agency (EPA), Emission factor, introduction to AP 42. Volume I, Fifth edition. USA: Environmental Protection Agency, 1998.