

## Associated petroleum gas utilization in Tomsk Oblast: energy efficiency and tax advantages

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**Abstract.** This article deals with oil production companies activities in increasing the utilization volume of associated petroleum gas (APG) in Tomsk Oblast. Cost-effectiveness analysis of associated petroleum gas utilization was carried out using the example of gas engine power station AGP-350 implementation at Yuzhno-Cheremshanskoye field, Tomsk Oblast. Authors calculated the effectiveness taking into account the tax advantages of 2012. The implementation of this facility shows high profitability, the payback period being less than 2 years.

### 1. Introduction

Russia's support for the sustainable development idea defined the trends for improving economy competitiveness through reduction of resource intensity, GDP energy intensity, as well as harmful environmental effects. In 2007, since the volume of cost-effective associated petroleum gas (APG) usage was about 50%, it was decided to increase the volume of APG up to 95% with the help of tax penalties and advantages. The first resolution of the RF Government determined a target value of APG flaring no more than 5% [1]. According to the preliminary results of this resolution implementation in 2012, as well as considering some counteractions from several oil companies [9], the Government decided to strengthen reprisal measures and increase tax penalties for APG flaring from 1 January, 2013. Multiplying factors were established in the payment calculation formula from 4.5 in 2012, to 12 in 2013 and to 25 in 2014. Without metering devices, the factor is 120, regardless of flaring volume (6 in 2012). As a result, double growth of annual APG utilization investments is expected as well as refining capacity construction will increase up to 50 billion rub. This allows increasing APG utilization level from 76.2 in 2012, up to 78.8 in 2013, up to 80 in 2014, up to 95 % in 2015. [2]

Success of the associated gas emission reduction program has been already remarkable - Russian oil companies will have reduced APG flaring by 29% from 15.8 billion cum in 2013 to 11.2 billion cum in 2014. APG production in 2014 will decrease only by 3.9% to 71.5 billion cum [3]. The leaders in utilization, i.e. vertically-integrated oil companies, which recycled APG in 2013, are "Surgutneftegas" (99.3%) and "Tatft" (93.6%). Other companies utilized fewer APG: "Lukoil" (87.8%), "Gazprom oil" (79.5%), "Rusneft" (77.1%), "Slavneft" (76.6%), "Bashneft" (72.7%), "Rosneft" (63.6%).

We should mention some disadvantages of associated gas emission reduction program. According to the results of 2012, the total volume of oil companies' tax penalties for APG flaring reached 16.5 billion



rub. Total tax penalties sum for the period from January to September of 2013 was 181.34 billion rub, while payment sum for APG flaring and/or dissipation was 1.122 billion rub.

Taking those facts into account, oil companies were offered to balance unit investments to reach 5% flaring - about 4800 rub for 1000 cum, and the unit payment for 1000 cum of flared APG is 20 rub. Oil companies supported this offer. For example, LUKOIL invested 8.25 billion rub into APG utilization over 9 months of 2013, being the second after «Rosneft» 17.48 billion rub. [4].

Now let us analyze another aspect of the politics, i.e. stimulating. It is commonly known that combination of both measures is optimal, as stimulating actions define realization of some politics and restrictive ones – its usage [13].

The direct support programs, including concessionary financing and tax incentives, are an example of stimulating actions. Such measures are thought to be important financial mechanisms which the Government uses for increasing investments into energy efficiency. Program of direct support and credit accommodation, with guaranties from the Government to pay the interest rate, contribute to technological investments and gaining valuable experience, which could result in further technological development, knowledge acquiring, and potential market expansion. However, such programs and credit accommodation are rather costly and should be used to assist in implementation new energy efficiency technologies, i.e. they should provide consumers' awareness and develop the market [11].

The legislation provides the following measures for business companies aimed at energy saving and energy efficiency increasing: government loan guaranties; tariff regulation; tax advantages; investment tax credit. RF Internal Revenue Code provides the following tax advantages and tariff incentives for the companies: firstly, exemption from business property tax (p.21, 3 art. 381); secondly, increasing factor of depreciation value for income tax (p.1, art. 259.3); thirdly, investment tax credit (art. 67 IRC).

Property tax relief has been provided for the companies investing in energy efficient technologies, fixed asset since 1 January (p.21, art.381 IRC RF):

- 1) with regard to newly commissioned projects of high energy effectiveness in accordance with the list of such projects provided by the Government;
- 2) with regard to newly commissioned projects of high energy effectiveness class, if determination of energy effectiveness classes is provided by RF legislation.

Within 3 years from the day of such property registration, it is not included into the base of property tax [5].

## **2. The Tomsk Oblast APG utilization features**

The main peculiarity of oil production in the Tomsk Oblast is medium and small size fields with low APG resources. Their location in lightly settled land with the absence of large fuel buyers results in low amounts of APG utilization. Gas-to-oil ration in extracted oil for various fields can vary significantly within 30-80 cub. m/t.

Having analyzed the table one can see that over 3 billion cum was extracted in Tomsk Oblast. The largest license holders of the region extract 2.9 billion cum: LtD “Tomskneft VNK”, LLC “Gazpromneft-vostok”, LtD “Tomskgazprom”. LtD “Tomskneft VNK” holds the first place (1.76 billion cum) exceeding LLC “Gazpromneft-vostok” 2.27 times, and LtD “Tomskgazprom” 5.2 times at the APG production level. However, smaller companies are leaders at the level of APG utilization: LtD “VTK” (99%), LLC “Sredne-Vasyuganskoye” (97%). Among bigger companies leaders are LtD “Tomskneft VNK” – 85%, LtD “Tomskgazprom” – 69%, LLC “Gazpromneft-vostok” is left behind significantly – 19%. Nevertheless, it should be mentioned that no company reached required 95% of APG utilization.

Industry experts distinguished three main factors which prevent regional companies from reaching 95% level of APG usage.

Table 1. APG production profiles and usage by the Tomsk Oblast license holder for 2012, thous. cum. [6].

License holder	Crude-oil production, thous. T.	APG production, mln cub. m	APG usage, APG	APG usage level, %
LtD "Tomskneft" VNK	6969.8	1762.9	1491.7	85
LLC "Gazpromneft-vostok"	1191.5	338.7	62.9	19
LtD "Tomskgazprom"	1059.3	775.1	534.1	69
NC "Rusneft"	1045.2	89.7	6.5	7
Imperial Energy	621.1	78.2	23.9	31
LtD "VTK"	424	21.3	21	99
LLC "Matyushkinskaya vertical"	206,2	12,0	8,4	69
LLC "Stimul-T"	104.8	5.9	4.7	80
LLC "South-Ohteurskoye"	74.8	5.8	2.2	37
LtD "Tomskgeoneftegaz"	29.4	1.0	0.3	29
LLC "Sredne-Vasyuganskoye"	17	1.0	1.0	97
LLC "Giant"	1.5	0.3	0	14

Firstly, Tomsk resources are mainly oil-based: out of 11.7 mil tons of produced oil in 2012, there were 4.6 billion cum of APG. Technological, logistic, and economic peculiarities are mainly based on oil. Secondly, Tomsk oil and gas industry is distinguished by geographic dispersion of oil fields and scarcity of their reserves which prevents from considering APG usage as a cost-effective project. Thirdly, main gas pipeline "Nizhnevartovsk – Parabel - Kuzbas" runs far away from main oil-producing areas of the region. Therefore, transport access to the facilities is rather a costly task.

At Luginetskiy oil, gas and condensate field, which provides over 70% of "Tomskneft" APG amount, gas treatment and gas-compressor station (GCS) is in operation. In late 2011 it transported jubilee 10 billion cubic meter to the gas pipeline system. In 2012 the gas volume transported to the main gas pipeline exceeded 1.2 billion cum.

In 2012 at LtD "Tomskneft" oilfields the following construction was carried out as a part of the gas program: main gas pipeline "West-Moiseevskoye oilfield – Dvurechenskaya GTPP"; vacuum GCS Free Water Knock Out (FWKO) unit at Igolsko-Talovoye oilfield; vacuum compressor station FWKO unit–9 of Sovetskoye oilfield; vacuum compressor station FWKO unit–5 of Vakhskoye oilfield and flare facilities upgrade; gas engine power station of 5 MW at Yuzhno-Cheremshanskom oilfield; GTPP at Dvurechenskaya oilfield.

In 2012 GTPP of 12 MW power was commissioned at Igolsko-Talovoye oilfield, in addition to 24 MW station, which has been operated since 2004 [7].

Application of modular gas engine power unit for APG utilization at oilfield (for example, Yuzhno-Cheremshanskoye oilfield). Yuzhno-Cheremshanskoye oilfield is located in the Karagasok district of Tomsk Oblast, the Russian Federation, 40 km North from Noviy Vasugan settlement. Oil and gas production unit №7 (OGPU – 7), which provides service to Yuzhno-Cheremshanskoye oilfield, controls extraction operations at Vasugan district as well, where there are 7 oilfields - Olenye, Severo-Olenye, Lomovoe, Yuzhno-Cheremshanskoe, Kolotushnoe, Katylginskoe, and Ontonigajskoe. Most of them have been developed over the past 30 years. Oilfield production is 1500 t oil per day, water cut amounts 80%.

Daily, at Yuzhno-Cheremshanskoe oilfield high-pressure flare (HPF) 37 thous cum of APG are flared, 26 t of them accounts for methane. Since 01.01.2012, according to RF Government Regulation d.d. 8

January, 2009 №7 “On Measures to stimulate decrease of atmospheric air pollution with APG flaring combustion gases” payments for flaring over 5% of APG has been increased in 4.5 times [8].

Implementation of gas engine power station will decrease air pollution and large energy costs.

In this particular paper, we analyze gas engine power station AGP-350, produced by CJSC “PFK “Rybinskkompleks”. Gas engine power station is a system developed on the basis of conventional engine working on natural gas or any other gas fuel. Production of two energy types – caloric and electricity – is possible.

Cost-effectiveness analysis of Yuzhno-Cheremshanskoe oilfield was carried out by the authors. In 2012, over 28 thous. tons of oil and over 1.5 mil cum of APG were produced, in this case the utilization level was a vanishingly small value. Therefore, it was chosen as a pilot oilfield for estimation of implementation efficiency of the most common way of APG utilization - gas engine power station.

AGP-350 gas engine power system cost is 6 011.27 thous. rub. The approximate cost of testing and commissioning is 10% of equipment cost; maintenance service cost is 10% of equipment cost. AGP-350 power is 332.50 kWh. According to OPNG UPNG, gas cost, including VAT, is 631.3 rub/thous cum. Electricity cost according to Electric Board data, is 2.54 rub kW. Energy consumption demand is 3 200.00 kWh. According to log sheet of 15 February, 2012 the APG flaring volume is 36 497.00 cub. m/day

The energy cost for facility operations is 71 201.28 thousand rub per year. Flaring emission cost at the high pressure flare (simplified calculation) for methane is 12 571.93 thousand rub per year. In total, the cost before implementation is 83 773.21 thousand rub per year.

Cost calculation after implementation of 10 AGP-350. The total annual cost after implementation is 81 492.78 thousand rub per year. The total cost advantages - 2 280.43 thousand rub per year. Calculation of cost after two year implementation: the total annual cost after implementation is 15 244.11 thous. rub per year; the total cost advantages - 68 529.10 thousand rub per year.

Thus, using AGP-350 will save 68 529.10 thous. rub paid for electricity per year. It will lead to emission reduction and, consequently, decreasing penalties.

### 3 Conclusions

Resolution of the RF Government to reach 95% of APG utilization can be achieved in 2015. Tax penalties and tax advantages are mechanisms for reaching this factor. Tax penalties prevails tax advantages. Multiplying coefficient can reach 25 (without metering devices – 120). Whereas, tax advantages are determined by income tax related to accelerated cost recovery, though such a measure is applied to facilities for APG utilization as a special case, tax advantages for corporate property tax related to the equipment installed in 2013. Besides, a special case is tax advantages for APG utilization facilities.

Therefore, in APG utilizing gas engine power stations are a priority. This particular article analyzes an example of AGP-350 gas engine power station implementation at Yuzhno-Cheremshanskoe oilfield. Economical indicator calculation has revealed the high effectiveness of this APG utilization method: cost effectiveness is over 75%, payback time is less than 2 years. Moreover, annual energy saving is 68 529.10 thous. rub per year.

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