ASSOCIATED GAS FLARING

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A gas flare or a flare stack is a gas combustion machine used in chemical plants, natural gas processing plants and at oil and gas production having wells, offshore oil and gas rigs and landfills.

They are used to eliminate waste gas which is otherwise not feasible to use or transport. They also act as safety systems for non-waste gas and are released via pressure relief valve when needed to ease the strain on equipment. When industrial mechanical equipment items are over-pressured, the pressure relief valve is a safety device that automatically releases gases and sometimes liquids. The pressure relief valves must have industrial design codes, standards and state permission [1].

The released fluids are transported through large piping systems called flare headers to a vertical elevated flare. The gases are burnt as they get out the flare stacks. The size and brightness of the resulting flame depends on the material's flow rate in joules per hour.

Better part of industrial plant flares has a vapor liquid separator (knockout drum) upstream of the flare to remove any large amounts of liquid that may accompany the relieved gases.

Steam is very often injected into the flame to reduce the formation of black smoke. When too much steam is added, a condition known as "over steaming" can occur resulting in reduced combustion efficiency and higher emissions. To keep the flare system functional, a small amount of gas is continuously burned, like a pilot light, so that the system is always ready for its primary purpose as an over-pressure safety system.

Burning and flaring of associated gas from oil drilling sites is a main source of carbon dioxide (CO_2) emissions. Coupled with fossil fuel combustion and cement production, flaring's carbon dioxide emissions in 2010 have increased (1300 ± 110 Gt CO2) compared to the last recording (years 1750-1970, 420 ± 35 GtCO had been emitted.) 2400×10^6 tons of CO2 are emitted every year in this way and it is about 1.2 percent of the worldwide emissions of carbon dioxide. That may seem to be more serious, but in perspective it is more than half of the *Certified Emissions Reductions* that have been issued under the rules and mechanisms of the Kyoto Protocol [1].

American satellite data shows that for 5 years (2005 to 2010), global gas flaring decreased by about 20%. The most significant reductions of volume were made in Nigeria (down 29%) and Russia (down 40%).

Fig. 1. Satellite data

There are a lot of enterprises involved in the processing of APG. In these enterprises is separated associated gas, which depending on the field has a different degree of "fat"

APG processing at gas and petrochemical profile is the most important direction of its useful life. Therefore, at the present stage, to solve the problem of associated petroleum gas, both to solve environmental problems so as to increase the economic efficiency of gas and petrochemical industries. APG to gas processing plants processed (is separated) in the dry stripped gas (DSG), which enters the main gas pipelines,as well as a broad fraction of light hydrocarbons , which is an important raw material for the petrochemical industry. NGL is a basic raw material for the production of liquefied petroleum gas, petrochemical, and other products.

In turn, the processing of natural gas liquids for the gas and petrochemical profile predetermines a higher yield of the desired product gas and petrochemicals as compared with the processing of traditionally used in Russia pyrolysis feedstock - straight-run gasoline. The economic effect is achieved not only due to higher yields of the desired olefins of the above hydrocarbon compounds, but also by reducing costs in the processing of ethane and propane-butane fraction in relation to the straight-run gasoline. Using ethane, propane, butane, allowing the creation of productive and more environmentally advanced technologies for synthesis of basic organic synthesis products. Thus itself the development of gas and petrochemicals can be a decisive element in the solution of environmental problems flared APG, by involving it in processing by petrochemical profile [2].

The second direction of useful utilization of associated petroleum gas is its use to generate electricity, in fact, for the needs of oil companies themselves.

These two areas are considered "useful recycling" in the license agreements for the extraction of hydrocarbons. The main condition is not to send to the torches of more than 5% of associated petroleum gas. From an environmental point of view, the burning of associated gas in power generation plants is not different from APG flaring. The difference between the first option - APG flaring in the power generator is not visible from satellites. The second difference - the problem is not regulated by any legal documents. In addition, the commercial gas turbine and gas turbine power plants do not burn dry stripped gas - mainly consisting of methane, and the gases of the second and third stage separation which, unlike methane, post combustion yield significant emissions of harmful substances in atmosphere. According to many officials, experts and specialists, dealing with waste - processing APG power unit is the same serious waste, as well as the use of smoky torches, destroying valuable for the gas and petrochemical industry.

Russia has announced it will stop the practice of *gas flaring* as stated by the deputy prime minister Sergei Ivanov on Wednesday September 19, 2007. This step was, at least in part, a response to a recent report by the National Oceanic and Atmospheric Administration (NOAA) that concluded Russia's previous numbers may have been underestimated. The report, which used night time light pollution satellite imagery to estimate flaring, put the estimate for Russia at 50 billion cubic meters while the official numbers are 15 or 20 billion cubic meters. The number for Nigeria is 23 billion cubic meters.

References

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RESEARCH ON PELLET IMPACT DRILLING: HISTORY, TECHNIQUES AND RESULTS

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Drilling in in hard and tough rocks is associated with low values of mechanical speed and bit pressure. Pellet impact drilling method is aimed at destruction of rocks due to continuous circulation of metal pellets provided by an ejector pellet impact tool string (EPITS) in a bottom-hole area. This prospective technique can result in a considerable gain of penetration rate within the range of hard and tough rocks; reduction of costs of a well construction by cutting down round-trip time. One more advantage of this method is that its implementation will not require considerable re-equipment of the drilling rig since pellet impact method easily adapts to the existing well drilling technology.

For the first time the method of rock destruction by pellet impact was offered in 1955 by a group of scientists from American company «Carter Oil». A jet pump was chosen by them as a device which can cause acceleration and recirculation of pellets. Despite the possibility of destroying rocks, the method was criticized by own pioneers. In fact, negative conclusions have been brought about owing to a procedure errors and a number of shortcomings of "gravity-aspirator" tool string (Fig. 1.) [1]. Nevertheless, this method continued to arise interest of some researchers. Since 1963 the EPITS was used for well deviation studies in the Southern Kazakhstan Geological Survey directed by A.B. Uvakov. Thereafter, the tool string has been improved numerous times. If Uvakov's EPITS could make up to 20 m/h in tough and very tough rocks, the "PIM-216" tool string (Fig. 2) designed by S. A. Zaurbekov in 1995 already showed excess of mechanical speed by 20% and bit pressure by 43% over the serial tools during its industrial testing [4, 5].

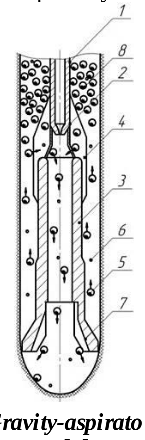

Fig. 1. Gravity-aspirator drill bit [1]
1 – drill string; 2 – primary nozzle;
3 – secondary nozzle; 4 – bars; 5 – rock-breaking pellets; 6 – cuttings; 7 – feet; 8 – pellet cloud.

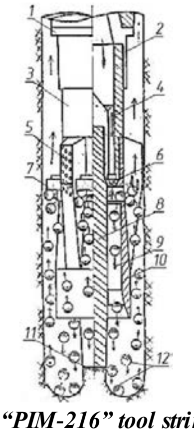

Fig. 2. "PIM-216" tool string with the nozzle and circular mixing chamber [5]
1 – calibrating device; 2 – sub;
3 – connector end;
4 – fluid delivery channel;
5 – calibrating and centralizing bars;
6 – circular nozzle; 7 – arrestor;
8 – drill bit holder;
9 – circular mixing chamber;
10 – drill bit body;
11 – hard alloy teeth; 12 – pellets.

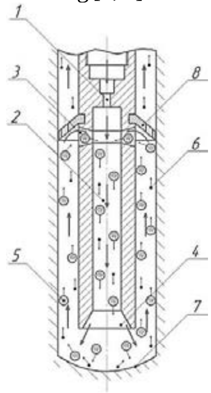

Fig. 3. Ejector pellet impact tool string [2]
1 – nozzle; 2 – mixing chamber; 3 – operating windows;
4 – diffuser; 5 – pellets; 6 – drilling cuttings;
7 – rock; 8 – arrestor.