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COOLING GAS FROM CONDENSED GAS DEPOSITS

V. P. Yablonskaya

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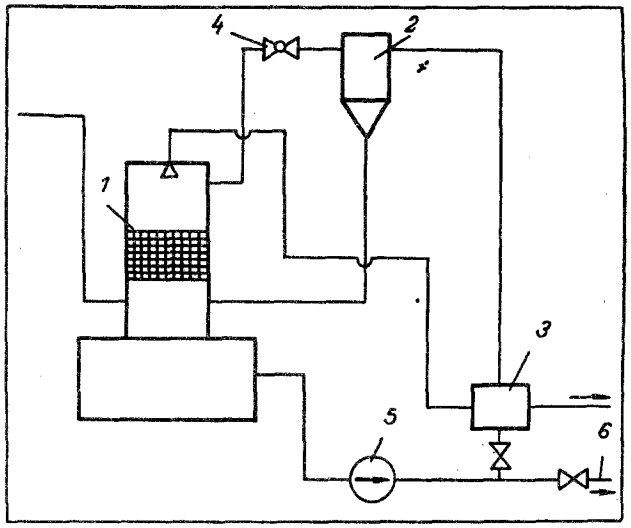
The gas from a well in a condensed gas deposit contains condensate and water, which must be separated from the gas, since otherwise they form crystalline hydrates that block the pipelines and equipment. Moreover, the condensate is a very valuable raw material used in industry [1]. It must be separated either by adsorption (with the aid of some adsorber) or by cooling the gas, when the heavier fractions separate out as condensate. The condensate is removed in a separator. Separation is carried out at a temperature of −5° to −15° C. In the initial period of operation of the well, the gas has great excess pressure, which is expended in a throttle valve [2]. In this process the gas expands and its temperature is reduced sufficiently for the condensate to separate.

However, as the deposit is used up, the natural pressure in the formation and at the well head falls, so that cooling of the gas by the throttle valve ceases to be sufficient. Therefore commercial equipment includes heat exchangers in which the hot gas from the well is cooled by cold gas from the separator. The lower the gas pressure in the formation, the greater the need to cool the gas entering the throttle valve to condense the high-boiling fractions.



Layout of gas cooling equipment: 1) scrubber; 2) separator; 3) surface heat exchanger; 4) throttle valve; 5) pump; 6) pipeline.

At present surface heat exchangers are being used to cool the gas upstream from the throttle valve. The high gas pressure ($10^4 - 12 \times 10^3$ kN/m^2), and clogging of the heat exchanger surfaces by crystalline hydrates and various sediments, makes it necessary to employ a "tube-in-tube" type heat exchanger, which is simple to operate and convenient to clean, but, at the same time, uses a lot of metal. Thus, it is desirable to devise other methods of cooling the gas ahead of the separator.

Methods using an intermediate liquid coolant, described in [3, 4], seem promising. The high-boiling part of the condensate, separated from the gas in the separator, may be used as the intermediate liquid coolant. The layout of the equipment for cooling gas with an intermediate liquid coolant is shown in the figure.

Gas from the well enters a scrubber and is sprayed with condensate recovered in the separator. Before entering the scrubber, the condensate passes through a surface heat exchanger, where it is cooled by clean gas that has already passed through the separator. The gas cooled in the scrubber enters a throttle valve, where the excess pressure is reduced and cooling occurs. The high-boiling fractions condensed in this way are collected in the separator. The condensate is

circulated through the system by a pump. The excess condensate, as it accumulates, is removed from the system through a pipeline. The advantage of the scheme described is that gas from the well is cooled in a scrubber and not in a surface heat exchanger. There is no risk of fouling the surface heat exchanger, because the gas that passes through it is already clean (after the separator), while the separated condensate can, if necessary, be passed through a supplementary filter.

The system described may be designed in the usual way [5, 6].

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Gubkin Institute of the Petrochemical and Gas Industry, Moscow