Power efficient device for pumping and compression pipes cleaning from asphalt, resin and paraffin deposits

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Abstract: this article deals with power efficient device to clean the pumping and compression pipes from asphalt, resin and paraffin deposits.

1. Introduction
Connections with high power efficiency of cleaning process of pumping and compression pipes from asphalt, resin and paraffin deposits of production are in search of power efficient methods or devices. To clean the pipes from residues of oil products, as a rule, the blasting method, method of washing with dissolvent or treatment with superheated steam with following mechanic cleaning are used. There are also other out of the ordinary methods. All methods are reasonably effective, but power and labor consuming.

To reduce the power and labor consumption of the process the local thermal cleaning method of inner surface of pumping and compression pipes was suggested.

2. Device
Device suggested in this research illustrated on the Figure 1 differs from [1] that it includes two circular plasmatrons 1 which are activated through the bracket 7 with the gear motor one from another, coaxially heating the cleaned metal pipe 9 with asphalt, resin and paraffin deposits 10, fixed in supports 8. The pipe with coaxially moving circular plasmatron is inside the heat-shielding case 14. Reducing transformer is a power supply 11 of the circular plasmatron which is supplied from the alternating-current mains of the commercial frequency, compressor 12 supplies the orifice gas (air). Receiving container 13 serves for accepting the discharged asphalt, resin and paraffin deposits from the pipe. Gases are removed though the branch pipe 15 with smoke extractor 16 and are supplied to the filter 17 [2].

Heat-shielding case 14 serves to protect from wind and residues with the purpose of reducing the cooling of the pipe, it can be opened along the whole length. The cleaned pipe 9 with asphalt, resin and paraffin deposits 10 is installed to supports 8 on which the coaxial circular plasmatrons 1 are installed. Heat-shielding case which consists of upper half 20 and lower half 21 opens and closes using loops 22 and is fixed by clamps. Device for cleaning pipes from asphalt, resin and paraffin deposits is installed on the operating position at the angle of 20º to the horizontal surface. Circular plasmatrons are actuated and orifice gas is supplied with compressor 12. Circular plasmatrons (the first of which is in the beginning of the pipe and the second is in the middle of the pipe) through the bracket 7 with gear motor with frequency transducer 18 start the coaxial movement by chain drive to the cleaned...
pipe from bottom to top heating the whole area of the pipe. The plasmatron moving speed 1 is set depending on the outer diameter 9 and pipe wall thickness.

![Diagram](image)

**Figure 1.** Operating position of dismantled pumping and compression pipes thermal cleaning device from asphalt, resin and paraffin deposits.

Softening and melting of the thin wall layer of asphalt, resin and paraffin deposits from the cleaned pipe inner surface is achieved at the expense of outer heating by plasma current 4 and high thermal conduction of the cleaned pipe material [3]. Melted section of the wall layer of asphalt, resin and paraffin deposits partially flows down to the receiving container 13 and free discharge of built up gases is being provided. Built up gases are removed with smoke extractor 16 along the pipe branch 15 connected to the upper part of the cleaned pipe, later being cleaned from pernicious elements in the filter 17 [4].

3. **Computer simulation**

For more complete study of temperature field distribution and asphalt, resin and paraffin deposits melting the computer simulation of the heating process of pumping and compression pipes with asphalt, resin and paraffin deposits was performed in Star CCM+ [5] program package. Calculation results are shown at Figure 2 and 3 [7].

Figure 2 shows the scalar temperature field after 140 sec from the cleaned pipe in the cross-section. Figure 3 shows the scalar temperature field after 140 sec from the cleaned pipe in the cross-section with 1 m length.
4. **Conclusion**

Energy content reduction when using this device for thermal cleaning of dismounted pumping and compression pipes from asphalt, resin and paraffin deposits is achieved in the following way:

a) by power consumption reduction of the thermal cleaning process of dismounted pumping and compression pipes from asphalt, resin and paraffin deposits by reducing the heat loss reduction and cleaning process speed increase.

b) by reduction of environmental emissions by cleaning of exhaust gases.

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