Determination of the Time of Carrying out of Partition Procedures in the Discard Line of Pipelines

R. I. Askerova
Azerbaijan State Oil and Industry University

Abstract: *When exploiting gas – liquid discard lines inside pipelines sediments are formed, which decrease or stop their flowing ability. When untimely carrying out purification works restore of flowing ability becomes difficult and sometimes impossible. Hence, it is necessary to carry out purification works as soon as considerable changes are revealed in the pipelines.*
Theory of catastrophes is offered to determine this time.
Application of the method in 9 discard lines of "Bulla - deniz" OGES allowed to determine rational time for carrying out purification works allowing to restore normal flowing ability of the pipeline.

Key words*: discard lines, flowing ability, purification works, determinant, to restore, sedimentation, pipelines.*

I. Introduction

During the exploitation of discard lines some complications take part in them and it is connected with the sedimentation mainly of various substances (paraffin, resin, salt, sand and etc.). As a result, producing ability of pipes decreases, they are plugged and necessity to change them appears. Besides, together with worsening of transporting.

Thus, purification works are carried out by chemical, thermal and mechanical methods to restore pipe's yielding ability. But such works are mostly carried out at the period, when yielding ability of the discard lines decreases significantly. It results in inefficiency of these works, that is. Worsening of yielding ability of the pipe considerably.

In such cases as the cleaning of pipe doesn't give positive result sometimes it is changed. That's why the works should be carried out in time as soon as changes in the pipe are revealed. It is offered to use "accident" theory not requiring special researches to determine the time.

Mathematical model of "accident" theory makes it possible to determine quality change and time in the analyzed system [2,3]. Information is analyzed by the following differential equality:

$$\frac{dx}{dt} = ax^2 + bx + c$$

Here *x* are total values of the quantity characterizing the system (for example, consumption in discard lines); *a,b,c,* are the coefficients found by the method of smallest squares; Potential function of this equality is as follows.

$$U(x) = \frac{1}{3}ax^3 + \frac{1}{2}bx^2 + cx$$

This function can be changed to "accident" type by fuzzy transition, that is

$$U(x) = x^3 + Detx$$

Here $Det=b^2+4ac$ being the determinant defines variation limit of the parameters of the qualitative changes taking place in the system, but its sign determines character of these changes.

If *Det* quantity approaches zero or equals to it, quality changes can take place in the system. From other hand if $Det>0$, the system is stable otherwise, when $Det< 0$, the system becomes unstable.

At the time dispersion *D* is determined by the following equation:

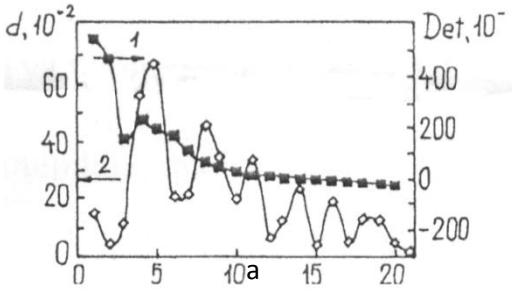
$$D = \frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2$$

Here *N* – is a number of points; $x_i \rightarrow i$ is total quantity characterizing system

$\overline{x} = \frac{\sum_{i=1}^{N} x_i}{N}$ is average mathematical expectation.

Time of works carrying out is determined due to calculated determinant and dispersion changes information of 9 discard lines in "Bulla - deniz" OGES has been used for the application of the shown method [4]. As main factor characterizing transportation process the consumption dynamics the oil passing through the pipelines.

Due to this dynamics, values of determinant and dispersion determined on the basis of computer program are given in the figure.


d, 10⁻²
Det, 10⁻
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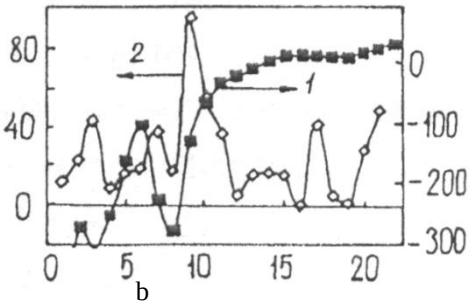
a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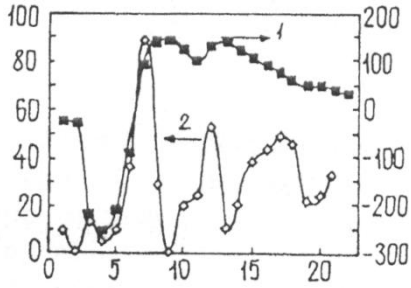
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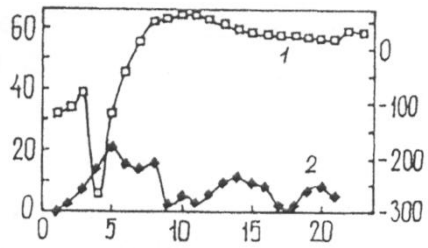
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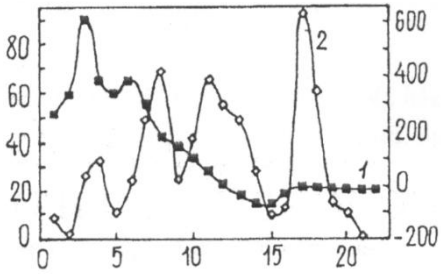
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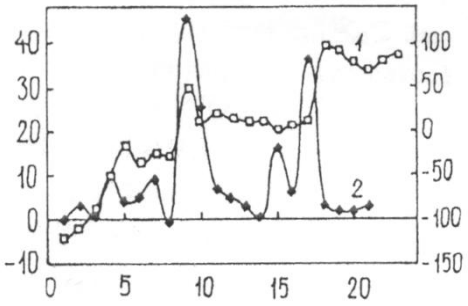
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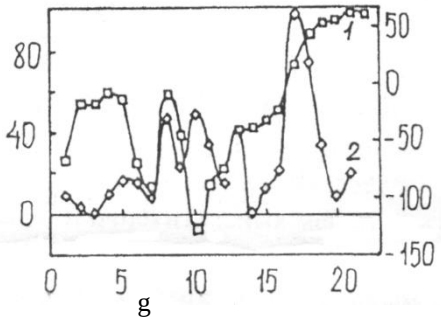
f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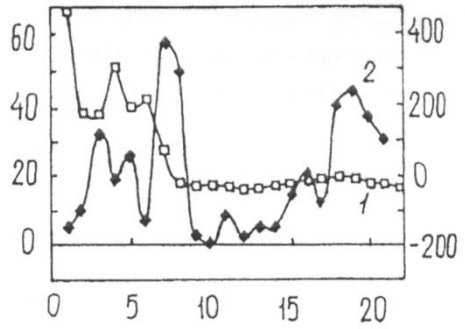
g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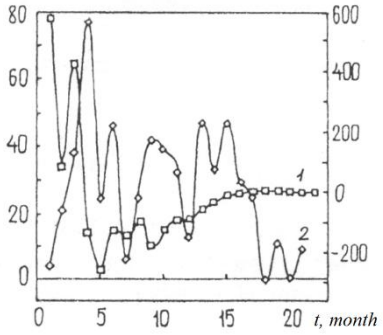
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t, month

o

Change of determinant (1) and dispersion (2) due to a, b, c, d, e, f, g, h, 9; 48; 122; 43; 61; 71; 65; 57 are discard lines.

As it is from the figure after definite time besides discard line N 57; in other 8 lines *Det=0*, that's qualitative changes took place in these lines. That's why time of carrying out purification works for these lines have been determined as follows.

N	Number of discard line	Months
1	9	16
2	48	16
3	122	8
4	43	7
5	61	14
6	71	9
7	62	16
8	65	9

Before it in discard lines 122; 48; 71; 43 and 62 *Det>0* that is the system was unstable, but then in *Det<0* the system became stable.

In lines N 9, 61, 65 the system first was stable then became unstable. As there were no changes in line N57 it needn't carry out any works.

Thus, increasing of efficiency of transporting in discard lines is possible by using of "accident" theory, determining their purification time and carrying out works in time.

Conclusion

1. Character and time of qualitative changes taking place in the system is determined by using "accident" theory and it makes possible to increase efficiency in the discard lines.
2. The offer has been tested in "Bulla - deniz" OGES and positive results have been achieved.

References

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