2	275	320	354	867.6	53.2	53.225	50.323	0.025	2.873
3	268	312	355	864.9	52.8	52.775	50.191	0.025	2.609
							average error	***0.024***	***2.976***
Hydrotreated diesel fraction "Winter"									
1	183	225	277	820.7	46.3	46.349	45.926	0.049	0.374
2	187	221	272	821.7	46.1	45.077	44.194	0.023	0.906
3	190	222	271	823.7	44.7	44.666	43.806	0.034	0.894
							average error	***0.035***	***0.725***
Hydrotreated diesel fraction "Summer"									
1	235	283	336	849.7	51.3	51.344	50.520	0.044	0.780
2	219	285	337	851.8	49.1	49.155	50.201	0.055	1.101
3	224	286	333	856.0	47.9	47.908	49.041	0.008	1.141
							average error	***0.036***	***1.007***

As it can be seen from Table , calculation according to ISO 4264 is more accurate and has less calculation error relatively to the experimental data in comparison with the calculation method by the USS 27768-88. However, it should be noted that the formula from USS 27768-88 uses less data and when cetane index changes within 42-50 points and it is characterized by the reasonable accuracy and can be used for the calculation. In the case of diesel fuel with a high cetane index (over 50 points), it is recommended to use a formula from ISO 4264.

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ANALYSIS OF GAS COMPRESSOR UNIT ACCIDENT FACTORS

O.L. Bulgakova
Scientific advisors associate professor N.V. Chukhareva, associate professor I.A. Matveenko
National Research Tomsk Polytechnic University, Tomsk, Russia

According to the official annual report from gas transmission provider, one of the reasons for gas supply limitation is usually emergency failure of gas compressor unit. This problem can be solved by formation of a new integrated approach to analyze gas compressor accident factors.

The problems of compressor station equipment fault tolerance was discussed in large number of researches [1 ... 3]. In order to obtain more detailed information, authors used operating data on each compressor station within no less than 5 years. Thus, in this work as inintial data was taken operating data of electric motor-driven compressor unit of two types SDT-4000-2 and EGPA-4,0/8200-56/1,26-P within 10 years, which are installed on the following compressor stations: "Aleksandrovskaja", "Vertikos", "Parabel", "Chazhemto", "Volodino", "Proskokovo". Accumulative operating time of electric motor-driven compressor unit was 805978 hours. At the same time 171 accidents of safe and unsafe accidental situations were recorded. Let the total amount of accident situation be 100% and further analysis will be carried out in percentage.

Statistical fault analysis of compressor station equipment within the period from 2005 to 2012 (Table) revealed the following causes for the emergency shutdowns of electric motor-driven compressor unit: failure / malfunction of electrical equipment, failure of instrumentation and control equipment systems, mechanical damage, power supply problems, malfunction of administration system, oil system problems, operational imperfection.

Table

Accident causes of electric motor-driven compressor unit

2001	Failure/ malfunction of electrical equipment	**0,6**	**4,7**	**2007**	Failure/ malfunction of electrical equipment	**-**	**3,5**
	Failure of instrumentation and control equipment systems	**-**			Failure of instrumentation and control equipment systems	**-**	
	Mechanical damage	**0,6**			Mechanical damage	**-**	
	Operational imperfection	**1,2**			Operational imperfection	**-**	
	Power supply problems	**2,3**			Power supply problems	**3,5**	
2002	Failure/malfunction of electrical equipment	**0,6**	**8,2**	**2008**	Failure/malfunction of electrical equipment	**-**	**6,4**
	Failure of instrumentation and control equipment systems	**1,8**			Failure of instrumentation and control equipment systems	**1,2**	
	Mechanical damage	**2,3**			Mechanical damage	**-**	
	Operational imperfection	**-**			Operational imperfection	**-**	
	Power supply problems	**3,5**			Power supply problems	**5,3**	
2003	Failure/ malfunction of electrical equipment	**2,9**	**15,2**	**2009**	Failure/ malfunction of electrical equipment	**-**	**7,6**
	Failure of instrumentation and control equipment systems	**1,8**			Failure of instrumentation and control equipment systems	**0,6**	
	Mechanical damage	**2,9**			Mechanical damage	**1,2**	
	Operational imperfection	**1,2**			Operational imperfection	**-**	
	Power supply problems	**6,4**			Power supply problems	**5,8**	
2004	Failure/ malfunction of electrical equipment	**1,8**	**11,1**	**2010**	Failure/ malfunction of electrical equipment	**-**	**8,2**
	Failure of instrumentation and control equipment systems	**2,9**			Failure of instrumentation and control equipment systems	**-**	
	Mechanical damage	**0,6**			Mechanical damage	**-**	
	Operational imperfection	**-**			Operational imperfection	**-**	
	Power supply problems	**5,8**			Power supply problems	**8,2**	
2005	Failure/ malfunction of electrical equipment	**3,5**	**17,0**	**2011**	Failure/ malfunction of electrical equipment	**1,8**	
	Failure of instrumentation and control equipment systems	**2,9**			Failure of instrumentation and control equipment systems	**1,2**	
	Mechanical damage	**1,2**			Mechanical damage	**0,6**	
	Power supply problems	**8,8**			Operational imperfection	**1,2**	
	Administration system problems	**0,6**			Power supply problems	**2,3**	
2006	Failure/ malfunction of electrical equipment	**0,6**	**7,0**	**2012**	Power supply problems	**1,2**	**4,1**
	Failure of instrumentation and control equipment systems	**1,8**			Failure of instrumentation and control equipment systems	**0,6**	
					Mechanical damage	**0,6**	
	Mechanical damage	**1,8**			Operational imperfection	**0,6**	
	Operational imperfection	**0,6**			Administration system problems	**0,6**	
	Power supply problems	**2,3**			Oil system problems	**0,6**	

According to the statistic data, each category of reasons was described by weighting factor (in percentage) in order to determine its contribution to the overall statistics (Fig.).

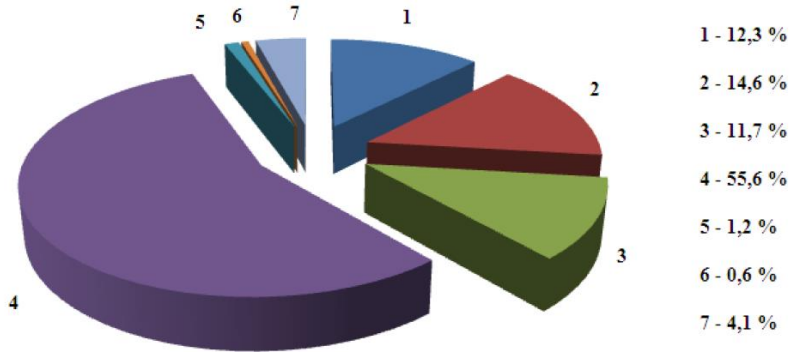

Fig. Accidental situation of electrical motor-driven compressor unit within period 2005 - 2012 in dependence of their causes: 1–failure/malfunction of electrical equipment; 2 – failure of instrumentation and control equipment systems; 3 – mechanical damage; 4 – power supply problems; 5 – administration system problems; 6 – oil system problems; 7 – operational imperfection

Based on the obtained results, failure history of electric motor-driven compressor unit, basic accident causes were:

- failure of electrical equipment*;*
- failure of instrumentation and control equipment systems*;*
- mechanical damage*;*
- power supply problems.

Above-mentioned main accident causes are largely determined by the influence of the human factor which determines the effective and safe operation of compressor unit not less than the technique. All this causes are qualified as regulated and controlled parameters by improving professional skills of service personnel and implementing technical standards.

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DEVELOPMENT OF TECHNICAL AND TECHNOLOGICAL SOLUTIONS FOR SURFACE CASING DRILLING IN DULISMINSKOYE OILFIELD (IRKUTSK REGION)

K. Buzanov
Scientific advisors associate professor K. Borisov, associate professor O. Uljanova
National Research Tomsk Polytechnic University, Tomsk, Russia

Oil and gas sector of East Siberia has been developing significantly in the Russian industry for last years, due to hydrocarbons. Oil reserves in Verkhnechonskoye field are estimated at 196 million tons, at Tolokanskoye and Yurubcheno-Tokhomskoye fields –more than 170 million tons; at Dulisminskoye oil and gas condensate field (DOGCF) – 81.5 million tons of oil and condensate, and 80 million m^3 of gas [1]. However, all hydrocarbon reserves in East Siberia are under difficult drilling conditions due to the complex geological structure of subsurface in the region.

Drilling process has shown that the surface casing drilling in the intervals of 0-300 m at Dulisminskoye field of Irkutsk region is systematically done under incompatible drilling conditions, because of exogenic rock fracturing in the interval of Litventsevskaya and Verkholenskaya suites [2].

The drilled rocks of Verkholenskaya suite are made by interbedding fractured siltstone of IV category (according to drillability), 7^{th} abrasiveness category with the density of 2650 kg/m^3; as well as claystone and highly fractured dolomites of III, V category (according to drillability)/ Also there are marls of V category (according to drillability), 4^{th} abrasiveness category and the density of 2670 kg/m^3.

The density of the above mentioned rocks in compliance with L.A. Shreyner's method varies from 20 to 142 kgs/mm^2**.** The rocks of Litventsevskaya suite are made of fractured limestones, dolomites and gypsum. The mineral density of these rocks of the suite is 2200 – 2850 kg/m^3**;** hardness varies from 25 to 571 kgs/mm^2**.** Average abrasiveness of the rocks of this suite is 3.5.

Due to the specific geological structure and, in particular, the interbedding of rocks with contrastively different permeability and mechanical properties, the surface casing drilling in the interval of 0 – 300 meters is made with mud loss of 30 cubic meters per hour that is incredibly consuming. For example, mud loss equals to 20 cubic meters per hour