

UDC 331.45

DOI 10.23947/2541-9129-2019-1-41-44

**ANALYSIS OF ACCIDENTS AND
INJURIES AT EXPLOSIVE OBJECTS OF
STORAGE AND PROCESSING OF PLANT
RAW MATERIALS***Biryulin A. E.*Don State Technical University, Rostov-on-Don,
Russian Federationmy_vesto4ka@mail.ru

The purpose of the analysis is to determine the complete picture of accidents and injuries of personnel with fatal consequences at explosive storage and processing of plant raw materials. The analysis is aimed at comparing data on the types and causes of accidents, as well as comparing data on fatal accidents, taking into account the risk and prevalence of traumatic factors. Along the way, the analysis of the impact of Supervisory activities on the safety of hazardous production facilities engaged in the storage and processing of plant raw materials was carried out. A comparison of the number of hazardous production facilities in different periods of time and the number of accidents and accidents occurred.

Keywords: Accident, accident, incident, explosion, human factor, fire, dust mixture, destruction of facilities, industrial safety, labor protection.

Introduction. Fire explosive storage facilities for processing plant raw materials are classified as hazardous production facilities of III and IV hazard class [1]. Great attention is drawn to the problems of fatal personnel accidents and injuries at such facilities. The occurrence of accidents at these facilities leads to significant destruction, fatalities and, which is important, to huge financial losses. The analysis of emergencies and accidents is aimed at evaluating the overall status of accidents, identification of causes, and determination of ways to reduce the impact of accidents and to reduce the number of accidents. According to the analysis of the data from the annual reports on the activities of the Federal Service for Environmental, Technological and Nuclear Supervision from 2013 to 2017 on fire explosive facilities for storage and processing of plant raw materials, it follows that during the reporting period there were 6 accidents and 21 fatal accidents [2]. In 2017, 2 accidents and 5 fatal accidents occurred at fire explosive facilities for storage and processing of plant raw materials in the Russian Federation.

Main part. Over the past five years, the number of supervised organizations and operated fire explosive facilities for storage and processing of plant raw materials has decreased. The number of supervised organizations decreased by 2.78 %, while the number of operated hazardous production facilities

УДК 331.45

DOI 10.23947/2541-9129-2019-1-41-44

**АНАЛИЗ АВАРИЙНОСТИ И
ТРАВМАТИЗМА НА ВЗРЫВОПОЖА
РООПАСНЫХ ОБЪЕКТАХ ХРАНЕНИЯ И
ПЕРЕРАБОТКИ РАСТИТЕЛЬНОГО
СЫРЬЯ***Бирюлин А. Е.*Донской государственный технический
университет, Ростов-на-Дону, Российская
Федерацияmy_vesto4ka@mail.ru

Целью работы являлось представление целостной картины аварийности и травматизма персонала со смертельным исходом на взрывопожароопасных объектах хранения и переработки растительного сырья. Сопоставлены данные по видам и причинам аварий. Проведен анализ влияния надзорной деятельности на безопасность опасных производственных объектов, осуществляющих деятельность по хранению и переработке растительного сырья. Проведено сопоставление количества опасных производственных объектов в различные периоды времени и количества произошедших аварий и несчастных случаев.

Ключевые слова: авария, несчастный случай, инцидент, взрыв, человеческий фактор, пожар, пылевоздушная смесь, разрушение сооружений, промышленная безопасность, охрана труда.

decreased by 15.2 %. In absolute terms, the number of supervised objects decreased by 1609 units. Despite the current trend of reduction of operated hazardous production facilities for storage and processing of plant raw materials, the annual quantitative indicators of accidents at the above facilities do not decrease over time (Fig. 1). Similar statistics is in the earlier period. Thus, according to the analysis of statistics (Fig. 2), we observe a similar pattern of accidents [3].

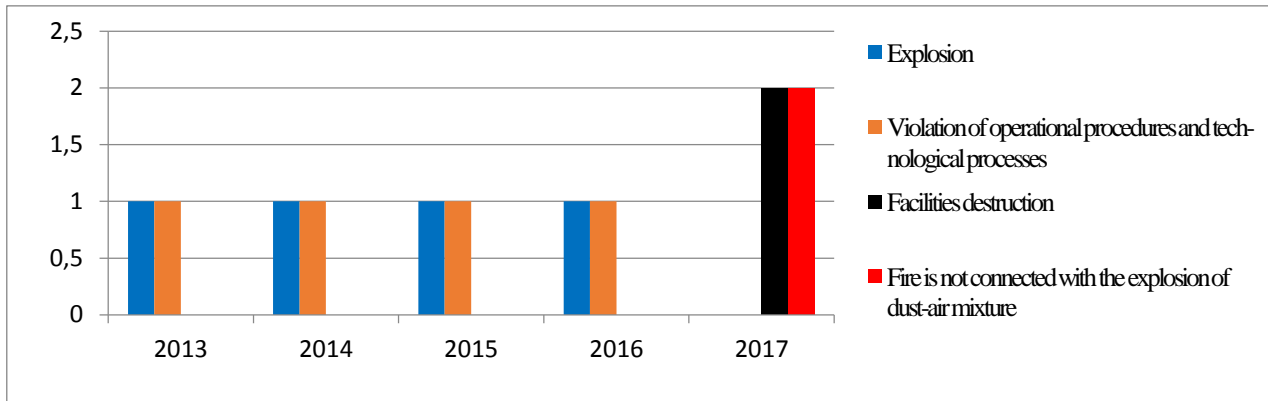


Fig. 1. Distribution of accidents by types and causes from 2013 to 2017

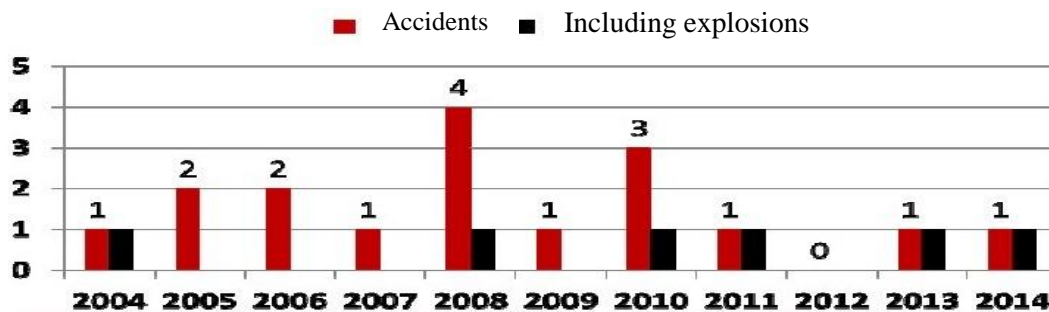


Fig. 2. Total number of accidents at hazardous production facilities for storage and processing of plant raw materials from 2004 to 2014

The most vulnerable in the context of explosion safety are elevators, feed and flour mills, and, with a small lag, silo warehouses [4]. It should be noted that the accidents mentioned in the statistics above are approximately equally distributed between hazard class III and hazard class IV.

The number of fatal accidents at fire explosive facilities for storage and processing of plant raw materials does not decrease during the analyzed period from 2013 to 2017. (Fig. 3). In just 5 years, there have been more than 20 fatal accidents. It should be noted that 70% of fatal accidents occurred at hazardous production facilities of hazard class III and only 30% at facilities of hazard class IV. Gradation of traumatic factors by the number of accidents occurred over the past 5 years is as follows (Fig. 4).

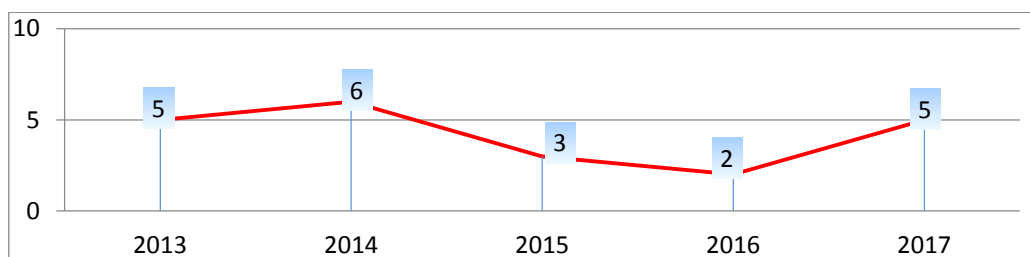


Fig. 3. Dynamics of the number of the occurred fatal accidents

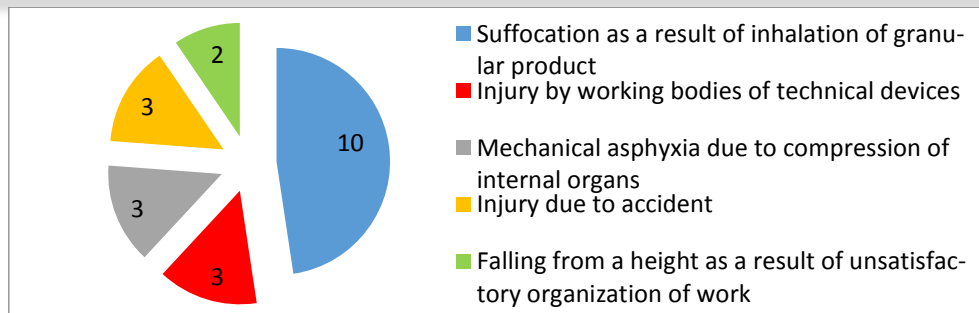


Fig. 4. Gradation of traumatic factors

The total number of incidents that occurred at the fire explosive facilities for storage and processing of plant raw materials is rapidly decreasing over the past five years (Fig. 5). It should be borne in mind that the picture may not be entirely objective due to incomplete information submitted to the bodies of Rostekhnadzor by operating organizations.

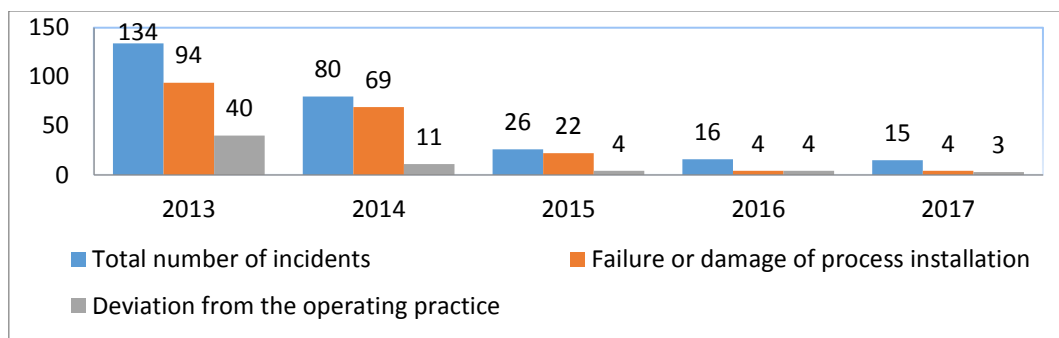


Fig. 5. Number and nature of incidents from 2013 to 2017

The analysis of supervisory activities for the same period from 2013 to 2017 shows that the total number of inspections has decreased sharply by almost 3.4 times. The number of scheduled inspections decreased by 5 times, and the number of unscheduled inspections decreased by 2.3 times. As expected, the total number of detected violations also decreased during the analyzed period. Thus, the total number of detected violations decreased from 2013 to 2017 by 2.3 times (by 57%). Quantitative indicators of measures taken to owners of hazardous production facilities in the detection of violations of industrial safety requirements, respectively, are reduced. However, as practice shows, with a decrease in the number of inspections, detected violations and applied measures, the number of emergencies and accidents remains at the same level. At the same time, the administrative burden on the supervised organizations and, first of all, on the regulatory authorities is reduced. The available administrative resources can be directed to the control of hazardous production facilities of higher hazard class.

Conclusion. The main causes of emergencies, incidents and accidents, largely, are violations of the order of work, processes, health and safety requirements. Production control is not provided properly, which is an indicator of the influence of human factor on the emerging problems [5]. Thus, three factors of occupational safety [6] remain without attention: human, industrial and organizational. In production, there is a certain problem between the high level of modern technology and the low level of its operation and maintenance. This is also true for complex processes. These findings are prerequisites to the consideration of further ways of safety provision at fire explosive facilities for storage and processing of plant raw materials using digital technologies in the context of a risk-based approach. The application of this approach should lead to a reduction in the burden not only on the supervised organizations, but also on the supervisory authorities themselves, thereby increasing the transparency and quality of organization of production control within enterprises.

References.

1. O promyshlennoy bezopasnosti opasnykh proizvodstvennykh ob'ektov: federal'ny zakon ot 21.07.1997 No. 116-FZ. [On industrial safety of hazardous production facilities: Federal law of 21.07.1997 No. 116-FZ.] Elektronny fond pravovoy i normativno-tekhnicheskoy dokumentatsii. [Electronic Fund of legal and normative-technical documentation.] Available at: <http://docs.cntd.ru/document/9046058> (in Russian).

2. Ezhegodnye otchety o deyatel'nosti Federal'noy sluzhby po ekologicheskomu, tekhnologicheskomu i atomnomu nadzoru. [Annual reports on the activities of the Federal service for environmental, technological and nuclear supervision.] Federal'naya sluzhba po ekologicheskomu, tekhnologicheskomu, atomnomu nadzoru. [Federal service for environmental, technological, nuclear supervision.] Available at: http://www.gosnadzor.ru/public/annual_reports/ (in Russian).

3. Gorbunov, E.V., Panova, L.V., Atamanov, S.G. Analiticheskiy obzor mer po preduprezhdeniyu i lokalizatsii avariyy na vzryvopozharoopasnykh ob'ektakh khraneniya i pererabotki rastitel'nogo syr'ya. [Analytical review of the measures on prevention and localization of accidents at fire explosive facilities for storage and processing of plant raw materials.] Scientific Journal of KubSAU, 2015, no.112 (08) (in Russian).

4. Egorova, I.V., Zholobova, M.V., Korsunova, D.A. Analiz avariyy na mukomol'nom zavode i razrabotka meropriyatiy po vzryvopreduprezhdeniyu. [Analysis of accidents in the milling industry and development of measures to explosion prevention.] Azovo-Chernomorskiy inzhenerny institut Don. GAU v g. Zernograd. sb. trudov: Obrazovanie, nauka, proizvodstvo. VIII Mezhdunarodny molodezhny forum. [Azov-Black Sea Engineering Institute of Don State Agrarian University in of Zernograd. coll. works: Education, Science, Production. VIII International Youth Forum.] 2016, pp. 152-156 (in Russian).

5. Bykov, A.A. O problemakh tekhnogennogo riska, bezopasnosti tekhnosfery i tekhnologicheskom budushchem: vzglyady, idei i mysli akademika V.A. Legasova. [On the problems of industrial risk, technosphere safety and technological future: views, ideas and thoughts of academician V. A. Legasov.] Strategiya grazhdanskoy zashchity: problemy i issledovaniya. [Civil Protection Strategy: Issues and Research.] 2011, vol. 1, no.1 (1), pp. 73-89 (in Russian).

6. Petrenko, V.V. Psikhologicheskie aspekty okhrany truda v sel'skom khozyaystve. [Psychological aspects of labor protection in agriculture.] Bulletin of Agricultural Science of Don, 2013, 1 (21), pp. 77-82 (in Russian).

Received 05.02.2019

Submitted 06.02.2019

Scheduled in the issue 15.02.2019

Autor:

Biryulin Aleksandr Evgenevich,

graduate student, the Department of "Life Safety and Environmental Protection», Don State Technical University, (RF, Rostov-on-Don, Gagarin sq. 1),

my_vesto4ka@mail.ru