Humanities and Social Sciences **2023**
Research Journal 30, No. 4 (2023) – part II, pp 417-424 **October-December**

Received: March 2023
Accepted: December 2023
DOI: 10.7862/rz.2023.hss.88

Norbert ŻYCZYŃSKI[1]
Tadeusz OLEJARZ[2]
Lucia BEDNÁROVÁ[3]

IT SUPPORT FOR DANGEROUS GOODS WAREHOUSE OPERATIONS IN RETAIL

This article describes basic IT support for dangerous goods inventory management in retail stores to ensure safe work. Retail network managers are often confronted with problems arising from the consequences of their chosen assortment choices. Time pressures related to seasonal assortment require the support of the IT system. For operators of regionally distributed shops, the central management aspect is of particular importance. Under such a requirement, the rapid and easy implementation of organizational and system design for a distributed business structure is key to achieving the expected result. A properly prepared system can significantly help in the process of implementing the idea of selling this type of material.

Keywords: ERP Systems, RMS Systems, dangerous goods, warehouse logistics.

1. DANGEROUS GOODS. PROBLEMS AND CHALLENGES

Managers of product ranges for stores could be faced with additional restrictions and legal aspects related to a specific group of goods. This type of product are dangerous goods, which additionally, as in the case of fireworks, also may be a seasonal offering. Providing management support for this type of product is a challenge. Dangerous goods are materials which have chemical, physical or biological properties that can cause damage or material injury or even death when improperly handled. The storage of dangerous goods is associated, among other things, with the possibility of serious health effects or even risk to life for people in the storage space and its environment. To avoid this type of situation, it is essential to apply the rules and regulations relating to the storage of this type of material. Enterprises that intend to expand their business in this area must be fully prepared for such situations. Therefore, compliance with obligations and tasks is important for warehouse managers and employees as well. For a company intending to trade with dangerous goods,

[1] Norbert Życzyński, Rzeszow University of Technology, Poland; e-mail: n.zyczynski@prz.edu.pl (corresponding author). ORCID: 0000-0003-0681-3072.
[2] Tadeusz Olejarz, Rzeszow University of Technology, Poland; e-mail: olejarz@prz.edu.pl. ORCID: 0000-0001-7940-3248.
[3] Lucia Bednárová, Technical University of Kosice, Slovakia; e-mail: lucia.bednarova@tuke.sk. ORCID: 0000-0002-8582-0643.

maintaining complete and reliable control over storage processes ensures safety and avoids the occurrence of harmful situations (Janczak, 2014). Dangerous goods are regulated or completely prohibited for transport. Such goods need to be properly labelled, packaged transported and stored to be allowed into the market (Grzegorczyk, Buchcar, 2019). Regulations on this subject can be found already in the international convention concerning the carriage of dangerous goods by road, concluded in Geneva on 30 September 1957 (Polish Journal of laws, 2021, pos. 874). under the general health and safety at work regulations, dangerous goods are classified as hazardous, in accordance with the regulations of the Chemical Substances and Mixtures Act, and materials containing harmful biological factors classified in hazard group 3 or 4 in accordance with the regulations on harmful biological factors for health at work and the protection of the health of workers professionally exposed to such factors (Żabiński, 2018). Based on known hazards, dangerous goods can be divided into 13 classes (Kwaśniowski, Kulczyk, Kierzkowski, Jóźwiak, 2014). Apart from the predominant hazard, which corresponds to the class name, a dangerous good may be characterised by an additional hazard. This additional hazard is determined on the basis of the class-specific criteria of the predominant character (Kopczewski, Nowacki, 2018):

- Class 1 – explosives materials and objects
  - mass explosion,
  - scatter, excluding mass explosion,
  - fire, with low risk of explosion, or scatter excluding mass explosion,
  - spontaneous ignition,
  - low probability of mass explosion or spontaneous combustion,
  - extremely insensitive with no mass explosion hazard.
- Class 2 – Gases
  - flammable gases,
  - non-flammable, non-poisonous gases,
  - poisonous gases.
- Class 3 – Flammable liquid
- Class 4 – Flammable solids
  - self-igniting materials,
  - materials generating flammable gases in contact with water.
- Class 5 – Oxidising materials
  - organic peroxides.
- Class 6 – Poisonous materials
  - infectious materials.
- Class 7 – Radioactive materials
- Class 8 – Corrosive materials
- Class 9 – Miscellaneous hazardous materials and objects.

An essential element that should be present with every dangerous good is the Material Safety Data Sheet. This document should contain basic physical and chemical details and describes the hazards that the material may cause. Such a card is intended to inform about potential hazards and the procedures that should be carried out in the event of an emergency (Polish Journal of laws, 2011, No. 63). In the case of retail stores, hazardous materials refer mainly to chemicals and pyrotechnics, which have the potential to cause problems if stored inappropriately (Prasuła, Mazur, Czerwinska, Cieślak, 2023).

2. BASIC IT SUPPORT FOR DANGEROUS GOODS WAREHOUSE OPERATIONS IN RETAIL STORES

Retailers do their business at the end of the product distribution channel, and their customers are mainly consumers. The transactions usually cover sales in relatively small quantities, and the customers are private persons who, therefore, gain access to the products and services offered by the producers. The sale of stored goods is an essential function for running this type of business, which has a direct impact on its performance and market position. Retail trade is therefore an activity that takes place in shops, ensuring direct, physical access of consumers to different types of products, including dangerous goods. In order to improve the protection of the interests of both the seller and the buyer, various types of norms and legislation regulating trade-related issues have appeared since ancient times (Stępień, 2000). In Poland, a turning point in the development of the retail sector was Poland's accession to the European Union in 2004. This provided domestic companies with easier access to European markets and capital, including a wide range of products, but at the same time forced them to adapt to EU regulations.

Dangerous (hazardous) goods are substances, preparations (mixtures), and articles (solid, liquid, or gaseous) which have one or more hazardous characteristics and can therefore cause danger to human or animal life or health, harm the environment or damage property. Therefore, dangerous goods warehouses must be planned, constructed and operated in a way that minimises risks to people, environment and property (Beutler et al., 2018). Structural preventive measures for the storage of dangerous goods are of primary importance, but the possibilities to improve and support organisational preventive measures are not less important. Preventive organisational measures are an important extension of structural measures and are designed to protect workers, the public, and the environment. They limit the occurrence of risk by optimising the handling within the warehouse of dangerous goods. The employer has full legal responsibility for protecting the health and safety of its employees, customers, and the environment. Appropriate training must be provided and rules for working with hazardous materials must be strictly enforced. Dangerous goods should not be stored in the warehouse without proper packaging, labelling, or having a safety data sheet. Another important aspect is the requirement to comply with maximum storage system loads, maximum permissible quantities, or stacking rules. Furthermore, once the expiration date is exceeded, the risk of hazardous waste arises, making it necessary to carry out stock management on a FIFO (First In – First Out) basis at the very least (EU-OSHA, 2023).

A properly prepared IT system can help make all the responsibilities more manageable. Basic IT support for dangerous goods storage processes is related to securing safe work organisation and secure internal logistics. In this context, a few issues that can be relatively easily supported by a warehouse IT system seem to be the most important. Detailed access control and verification of handling with dangerous goods can be ensured. These include ensuring detailed access control and verification of personnel working with dangerous goods, the definition, and control of the separate storage area, including the identification of the shelf allowed for dangerous goods, as well as the definition and control of the weight of the stored product that is allowed in the storage location. The rules defined in this way help to prevent the storage of dangerous goods in places not approved for this purpose and by persons not authorised for such activities, such as people who have not completed the required training. This also protects against the storage of too many goods at a location with a defined maximum load capacity. System control starts when a specific user attempts

to log into the system and protects against unauthorised access. The proper definition of users and their rights makes it impossible to use the system or any part of it without knowing the user name and password. Furthermore, each user, after logging in, has a set of rights and options defined by the administrator, which allows his or her work to be continuously monitored by the IT system (Figure 1).

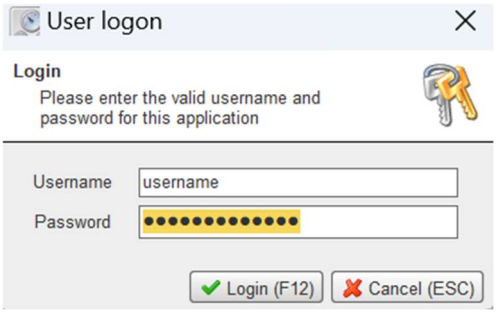

Figure 1. User login

Source: own research.

The first step to take to introduce dangerous goods into warehouse management is the definition of a new stock (Figure 2).

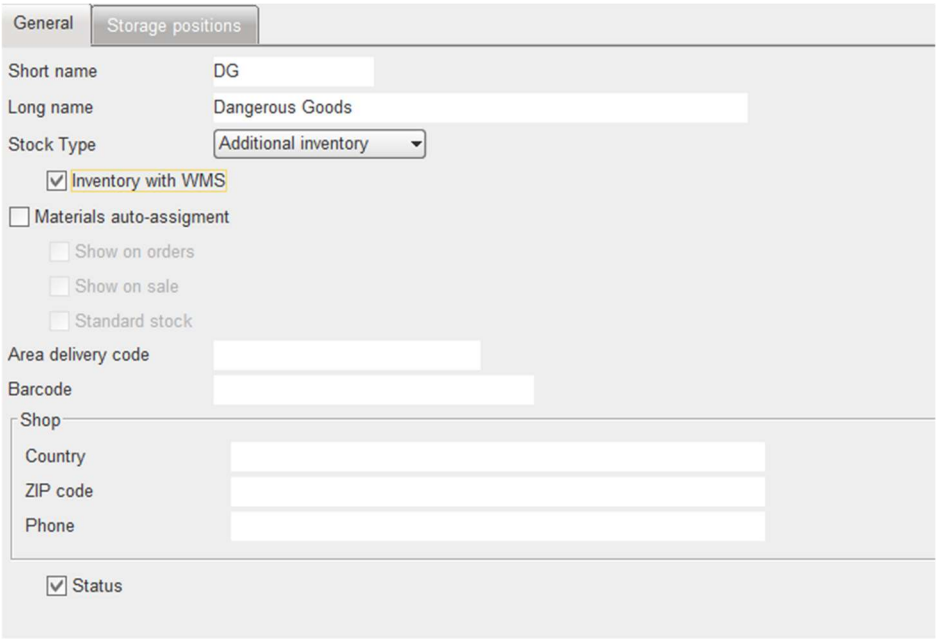

Figure 2. Definition of new stock for dangerous goods operations

Source: own research.

In the next step, storage locations must be allowed for the previously defined stock. This is particularly important to determine the permitted weight of the goods that can be stored at this new location. This will allow the system, while the employee is performing the task, to control the allowed filling of a specific shelf (Figure 3).

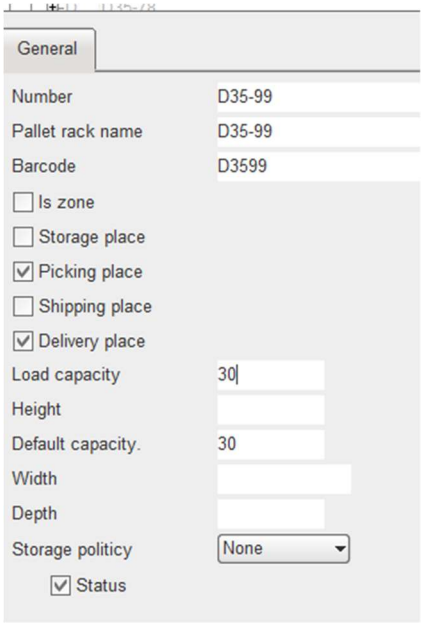

Figure 3. Definition of storage location parameters

Source: own research.

Next, a new article group should be defined for the dangerous goods (Figure 4).

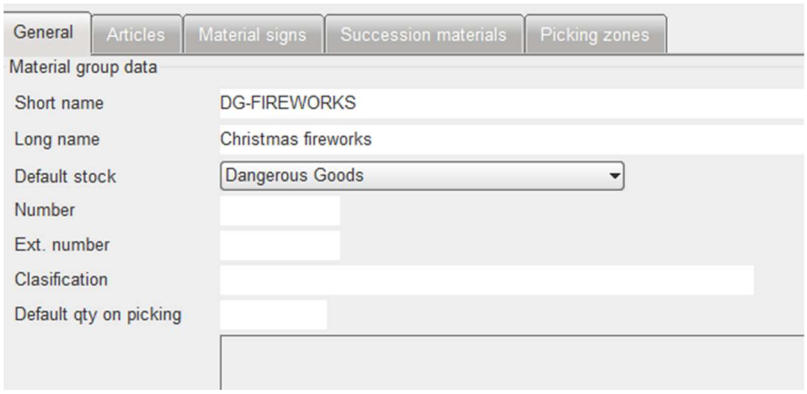

Figure 4. Definition of groups

Source: own research.

Once these initial operations have been performed, the definition of the new article can begin (Figure 5).

Figure 5. Definition of new article

Source: own research.

An important part of the definition for dangerous goods is the assignment of a previously defined stock (Figure 6) and the determination of the weight of a single item, which allows the placement of products to be controlled, taking into account the permitted capacity of the storage locations (Figure 7).

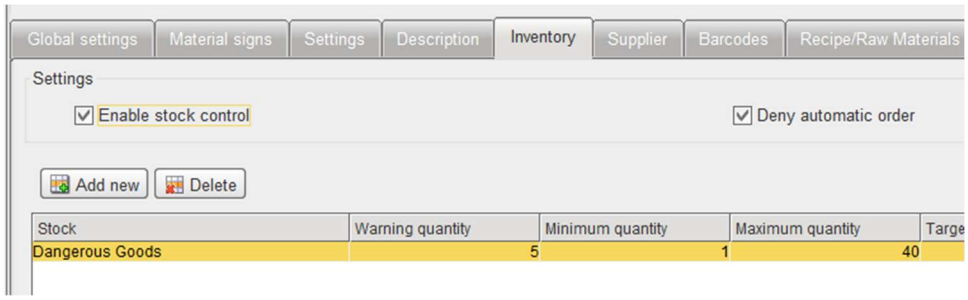

Figure 6. Add stock to article

Source: own research.

Figure 7. Definition of article weight

Source: own research.

Access to this type of storage can be restricted, e.g. users can only access the specific type of storage after completing training courses or obtaining certificates (Figure 8).

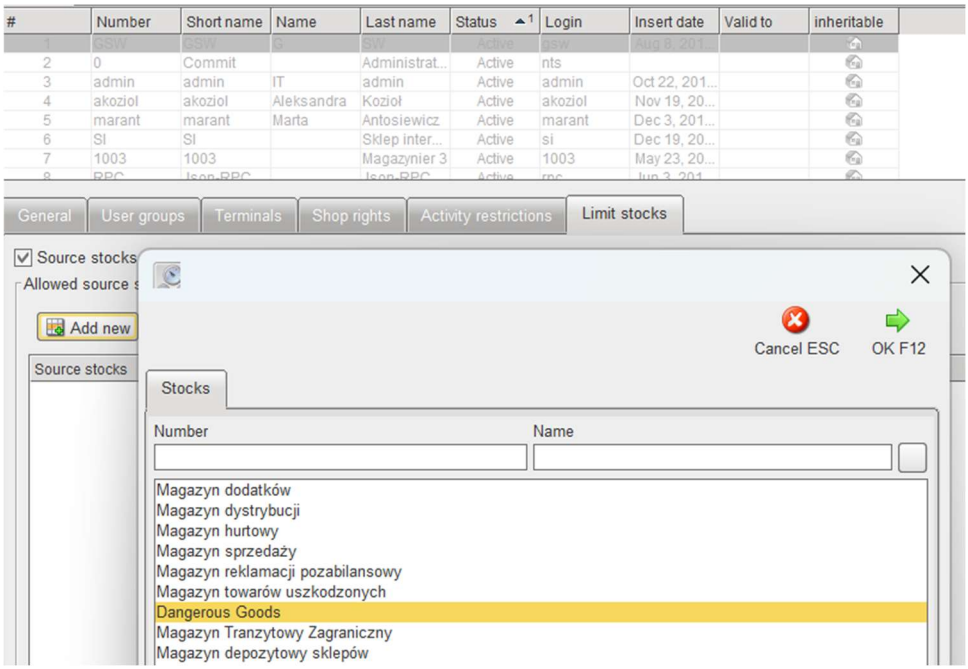

Figure 8. Allow user access to dangerous goods stock

Source: own research.

These relatively simple configuration tasks enable companies to store and trade dangerous goods. In the case of a retail network, the ability to manage all warehouses centrally is an important factor. As a result, a company's decision to introduce a new type of product can be implemented in all shops without high labour costs and with a minimum of potential mistakes.

3. SUMMARY

The management and storage of dangerous goods is associated with many challenges. Implementing a management decision to market a specific product is usually associated with a number of difficulties. in the case of dangerous goods, the number of difficulties appears to be much greater, especially as a large number of legal regulations have to be implemented. This is a big problem for a single independent retailer, but for a retail chain, it is a real challenge. In such a case, the ability to centrally manage the whole retail network seems extremely important. An IT system can be particularly helpful in this context. This paper presents a relatively simple way to obtain basic IT operational support for a dangerous goods launch intention. The results of the study indicate that this is important in the context of dangerous goods management, especially if such a system makes it relatively easy to set up and handle these types of case.

REFERENCES

Beutler, H.-P., Bouchex-Bellomie, H., Buchmann, A., Bürki, S., Dumont, R., Friedli, W., Hertzog, B., Kindler, P., Schefer, A., Sommer, M., Wegmann, L. (2018). *Leitfaden: Lagerung gefährlicher Stoffe*. Frauenfeld: Amt für Umwelt Kanton Thurgau.

EU-OSHA. (2023). Access on the internet: https://oshwiki.osha.europa.eu/en/themes/chemical-storage.

Grzegorczyk, K., Buchcar, R. (2019). *Przewóz drogowy towarów niebezpiecznych ADR 2019*. Błonie: Wydawnictwo ADeR Buch-Car.

Janczak, A. (2014). *ADR w spedycji i magazynie. Składowanie i przewóz materiałów niebezpiecznych*. *Vademecum BHP.* Warszawa: Dom Wydawniczy Zacharek

Polish Journal of laws. (2011), 63(322).

Polish Journal of laws. (2021), 874.

Kopczewski, R., Nowacki, G. (2018). *Ewaluacja stanu bezpieczeństwa przewozu drogowego towarów niebezpiecznych w Polsce*. *„Autobusy",* No. 9.

Kwaśniowski, S., Kulczyk, J., Kierzkowski, A., Jóźwiak, Z. (2014). *Ładunki niebezpieczne w transporcie towarów*. Wrocław: Oficyna Wydawnicza Politechniki Wrocławskiej.

Prasuła, P., Mazur, I., Czerwinska, M., Cieślak, P. (2023). *Safety risk posed by pyrotechnic materials. "Problemy Techniki Uzbrojenia",* No. 3(165).

Stępień, M. (2000). *Kodeks Hammurabiego (przekład)*. Warszawa: Wydawnictwo Alfa.

Żabiński, G. (2018). *Zasady i przepisy bezpieczeństwa przewozu ładunków niebezpiecznych. „Zeszyty Naukowe WSP",* No. 2.