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Online Software for Preparation of Summaries of Safety Data Sheets in Occupational Health and Safety: SDSSD

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ABSTRACT

Chemical risk factors are among the risk factors that can cause occupational accidents and occupational diseases in all workplaces. Recognizing the negative effects of these chemical risk factors and taking timely precautions are of great importance in eliminating the negative effects that employees may face. In order to increase the awareness of employees on the subject, information can be provided by placing the MSDS of the chemicals used in the workplace in the work area. Especially in workplaces where a wide variety of chemicals are used, there are some difficulties in placing these MSDS in the workplace. MSDS summaries can be used to overcome this situation. These MSDS summaries include the name of the chemical, hazard pictogram, hazard statements, precautionary statements and PPEs needed during the use of the chemical. With the MSDS summary for the relevant chemical, MSDS for chemicals in the workplace, which are often pages long, can be reduced to only A5 in size. In this study, a user-friendly online software, called SDSSD by the authors and whose web address is https://sdssd.com.tr/, has been developed that can fulfill all the requirements mentioned above and can design MSDS summaries for chemicals that can be found in any workplace. MSDS summaries can be easily created with this online application. With the SDSSD online application, informative warning signs can be created for all hazard class chemicals in the workplace. MSDS summaries will enable workplaces to contribute to achieving zero risk for employees through these warning notices.

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Key Words

Hazard, risk factors, material safety data sheet, OHS, SDSSD

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INTRODUCTION

Workplaces have become areas where employees can spend a long part or all of the day at the workplace with practices such as 24-hour work, overtime, etc[1]. Spending this long time in the workplace can, of course, allow employees to face many occupational accidents and occupational diseases[1]. In the workplace, hazards are situations that exist or that may come from the environment and have the potential to cause harm that may affect the employee or the workplace. The likelihood of loss, injury or other harmful consequences arising from hazards is called risk. An occupational accident is an event that occurs in the workplace or during the execution of the work, which may cause death or disable the body integrity mentally or physically. Diseases that occur as a result of occupational exposure during the execution of the work are called occupational diseases. Workers reach these occupational accidents and diseases by being exposed to physical, chemical, biological, ergonomic and psycho social risks. All of the risk factors categorized here affect workers in different ways depending on the type, form and duration of exposure. Among these risk factors, chemical risks can affect workers only if they are taken into the body in certain ways. Chemicals are taken into the body through inhalation, digestion and skin[1,2]. These chemicals that reach the body of employees can cause different diseases by reacting with the chemicals in the physiological structure of the person. Different types of measures can be taken to eliminate this situation. The most basic measure is to stop using harmful chemicals, and if this is not possible, it is preferable to replace them with less harmful ones. If this is not possible, collective protection measures and personal protection measures can be used to reduce the exposure of employees to harmful chemicals. In addition to these measures, trainings should be organized to increase the level of knowledge of employees about the chemicals they use and warning signs should be placed in the working environment. In particular, the Material Safety Data Sheet (MSDS) of the chemicals used in working environments should be used for this information purpose. MSDSs of any chemical substance to be used in workplaces contain information in 16 categories. These 16 categories are described below (Regulation on Safety Data Sheets Concerning Harmful Substances and Mixtures[3].

- Identity of the substance/mixture and the company/distributor.
- Information about the harmful effects of the substance.
- Information about the content of the substance.
- What to do if first aid is needed.
- What to do when exposed to fire.
- Precautions to be taken in case of release that may occur as a result of an accident.
- Storage conditions of the substance.
- Personal Protective Equipment (PPE) that should be used when working with chemicals.
- Information about the physical and chemical properties of the substance.
- Information about the chemical's stability and reactions.
- Information about the toxicological effects of the chemical.
- Information about the environmental effects of the chemical.
- What to do to dispose of the chemical.
- Things to consider when transporting chemicals.
- Chemical related legislation information.
- Other information about the chemical.

When the MSDS is examined, it will be seen that there are hazard clauses (H) to express the hazards that the chemical may pose and precaution clauses (P) to indicate what to do in case of exposure to the harmful effects of the chemical. Similarly, the MSDS includes the warning signs of the chemical and the personal protective equipment to be used during working with the chemical[1]. The information categorized above may contain pages of information depending on the type of chemical. Depending on the activities carried out in the workplaces, many chemicals are kept in MSDS work areas, making it almost impossible to examine this information in case of an accident. In this study, firstly, a sample application will be given on how easy-to-use material safety data sheet summaries developed by Ates (2024) can be created in workplaces. Then, the preparation stages of the MSDS summaries will be expressed through an online software called SDSSD developed by the authors. In this way, Occupational Health and Safety Specialists (OHSP) in workplaces will be able to create the MSDS summary of the chemical they need with this user-friendly online software and download it as a PDF file.

MATERIALS AND METHODS

Countless chemicals are used in every aspect of human life, especially in the workplace. There is a need for standardization so that chemicals produced, exported or imported worldwide can refer to the same chemical. Therefore, the Global Harmonized System of Classification and Labeling of Chemicals (GHS) was developed by the United Nations. The GHS system has systematized chemicals within the scope of international protocols. With this system, the confusion that may be caused by different classification systems at country level around the world is prevented[4]. Within the scope of GHS, chemicals are divided into three classes in terms of their hazards., physicochemical hazards, health hazards and environmental hazards[5]. (Fig. 1) shows the warning sign to be included in the summary of the MSDS to be

prepared by using the Guidance on Classification, Labeling and Packaging (CLP) for Salicylic Acid, which we present as an example in our study. Similarly, the Personal Protective Equipment (PPE) to be used in the design of the MSDS summary is shown in (Fig. 1). When the contents of the MSDS for chemicals are examined, hazard clauses (H) are used to describe the hazards that workers may be exposed to during work with the relevant chemical and precautionary clauses (P) are used to describe what to do when exposed to the hazards of the chemical. Some hazard and precaution clauses are shown below. Employees will be aware of the hazards that they may be exposed to when working with chemicals by learning the risk clauses before starting their activities and they will be aware of the precautions to be taken in case of chemical-related damages by learning the safety clauses. Within the scope of this study, the risk and safety phrases in the annexes of the "Regulation on Classification, Labeling and Packaging of Substances and Mixtures" and the "CLP Labeling and Packaging Guide" were used in the design of the MSDS summary developed by Ates. The MSDS summary for Salicylic Acid is shown in (Fig. 1)[4].

RESULTS AND DISCUSSIONS

Recently, the use of information technologies in many fields such as science, arts and sports has been increasing rapidly. The Internet, the most basic element of information technologies, has become the most useful tool worldwide.Utilization of information technologies in workplaces has also become a necessity. For this reason, it has become commonplace to prepare and use the SDSFs that should be kept in the working environment through online applications in order to keep the employee safe in the activities to be carried out with chemicals in the workplace. In this context, a web page named SDSSD, whose main web screen is shown in (Fig. 2), was developed by the authors. The developed software has a structure that can be easily used by OHSPs operating in all sectors of business life. Through the software, SDSSD summaries can be prepared for all chemical-using workplaces. In the SDSSD software, the flow diagram of which is given in (Fig. 3), the name of the chemical can either be selected with the drop-down button or the name of the chemical not included in the list can be typed. Then, the pic to grams of the hazard, hazard phrases, precaution phrases and personal protective equipment that should be used during working with the chemical can be selected with the drop-down button. After these processes, it can be downloaded to digital storage units in A5 size and PDF format by pressing the "Download SDS Summary" button. The "Chemical Name" drop-down button on the web interface called SDSSD contains 777 chemical names.

Some of these Chemicals are Given Below:

- Acetic acid.
- Cadmium chloride.
- Cyclooct-4-en-1-yl methyl carbonate.
- Hydrogen cyanide., hydrocyanic acid.
- Potassium bifluoride., potassium hydrogen difluoride.
- S-benzyl N, N-dipropylthiocarbamate., pro sulfocarb.
- Thiophanate-methyl (ISO)., 1,2-di-(3-methoxycarbonyl-2-thioureido) benzene[5].

Fig. 1: Salicylic Acid Summary of Material Safety Data Sheet

Fig. 2: Safety Data Sheet Summary Preparation Tool Web Page

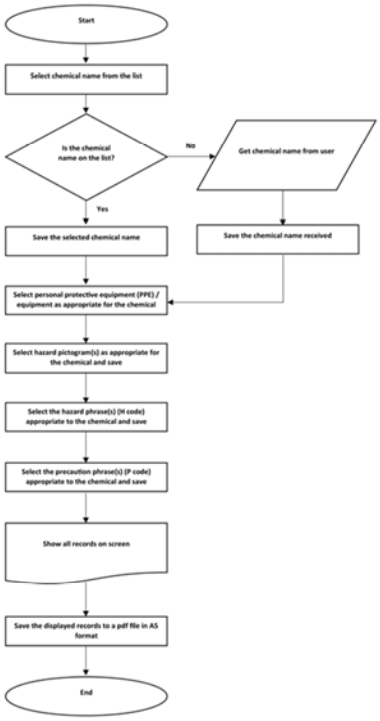

Fig. 3: Flow Diagram for SDSSD

The "Hazard Pictogram" drop-down button on the web interface called SDSSD contains 9 hazard pictograms. The pictograms used here are taken from the CLP guidance on labeling and packaging[4]. The "Hazard Phrase (H)" drop-down button in the web interface called SDSSD contains 111 hazard clauses.

Some of these Hazard Clauses are Given Below:

- **H200:** Unstable explosive.
- **H230:** May react explosively even in the absence of air.
- **H302:** Harmful if swallowed.
- **H334:** May cause allergy or asthma symptoms or breathing difficulties if inhaled.
- **H373:** May cause damage to organs through prolonged or repeated exposure.
- **H410:** Very toxic to aquatic life with long lasting effects.
- **H420:** Harms public health and the environment by destroying ozone in the upper atmosphere[1].

The "Precaution Phrase (P)" drop-down button in the web interface called SDSSD contains 142 precautionary clauses.

Some of these Precaution Clauses are Given Below:

- **P101:** If medical advice is needed, have product container or label at hand.
- **P201:** Obtain special instructions before use.
- **P282:** Wear cold insulating gloves and either face shield or eye protection.
- **P308+P313:** IF exposed or concerned: Get medical advice/attention.
- **P315:** Get immediate medical advice/attention.
- **P403:** Store in a well-ventilated place.
- **P502:** Refer to manufacturer or supplier for information on recovery or recycling[1].

The "PPE" drop-down button on the web interface called SDSSD contains 9 PPEs. The personal protective equipment used here is included in the Regulation on Health and Safety Signs.

Protecting the health and safety of employees during their activities in the workplace is among the most important duties of both employers and OHSPs. In order to ensure employee health and safety, risk factors in workplaces need to be evaluated well. Chemical risk factors are the most likely to cause occupational accidents and occupational diseases. Recognizing the effects of these chemical risk factors and taking timely measures can only be possible if the employee has knowledge about chemicals. Occupational Health and Safety trainings can be provided to increase the awareness of the employee on the subject, as well as informative warning signs can be placed in the work areas. For this purpose, MSDS of the chemicals used in the workplace can be placed in the work area and information can be provided. Especially in workplaces that use a wide variety of chemicals, placing these MSDSs in the working area has some difficulties. For this purpose, MSDS summaries developed by Ates (2024) can be used. These MSDS summaries contain the name of the chemical, hazard pictogram, hazard phrases, precaution phrases and the PPE needed during the use of the chemical. In this study, a user-friendly online software, called SDSSD by the authors, with the web address https://sdssd.com.tr/, has been developed that can meet all the above-mentioned requirements and can design MSDS summaries for chemicals that can be found in workplaces in all sectors. Through this online application, MSDS summaries in A5 size pdf format can be easily created. Thanks to the SDSSD online application, informative warning signs can be created for chemicals with all hazard classes in the workplace. Employees will be able to avoid occupational accidents, occupational diseases and near misses as much as possible through these warning notices. In the future, these MSDS summaries will be integrated into different online programs and workplaces will be able to contribute to achieving zero risk for employees.

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Key Points:

- Since the MSDSs that should be kept in workplaces contain a lot of information, the widespread use of MSDS summaries that employees can easily understand will contribute to making workplaces safer places for employees.
- The online application of the developed MSDS summaries can be accessed at https://sdssd.com.tr/.
- The online preparation of the new MSDS summary developed as a result of this study will enable OHS specialists to create a successful warning sign about the chemicals to be used in their work areas.

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