Sectoral Qualifications Framework for the Chemical Industry (SQF Chem)

European Funds
Knowledge Education Development

Republic of Poland

IBE kwalifikacje dla każdego

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1. Introduction

An essential condition for modern socio-economic development based on knowledge and information is the continuous improvement and adaptation of employees' skills for a dynamically changing labour market. This is especially important because unprecedented technological progress is making employees' knowledge obsolete, and their competences may need to be supplemented, developed and even at times completely transformed. Currently, a growing awareness is observed of the importance of continuously developing employees' skills in the processes of economic growth. The effectiveness of the actions undertaken to raise the level of human capital in accordance with the idea of lifelong learning lies at the heart of the success of modern, highly developed societies.

Data on the Polish labour market indicate that the developing economy is struggling with a shortage of adequately qualified workers. This results in prolonged recruitment processes and a significant increase in their costs, which is seen in most industries (PARP, 2019, p. 10). Over 70% of employers recruiting new workers reported difficulties in finding employees who met their expectations for their job position, a percentage that has been rising since 2009 (ManpowerGroup, 2020). Therefore, this situation is not temporary and constitutes a significant problem in Poland's economy today.

The phenomena and trends noted above should be linked to the fact that school and university education is not enough to keep up with the pace of the changes. This is why it is so important to support the idea of lifewide lifelong learning (hereinafter LLL). Its main principles include, among others, an appreciation of learning in various forms and places at every stage of life; the validation of learning outcomes regardless of the way, place and time of their achievement; as well as effective investments in learning and making this a universal endeavour (Council of Ministers, 2013).

In the case of Poland, the direct expression of state policy supporting modern educational processes is the *Strategy for Responsible Development until 2020* (with a perspective to 2030) adopted by the Council of Ministers on 14 February 2017 (Monitor Polski of 2017, item 260). Its objectives include, among others, ensuring citizens with an appropriate quality of education to improve competences. The Strategy will be implemented through human resource development programmes focusing on the achievement of specific learning outcomes, i.e. the knowledge, skills and social competence desired in a given sector of the economy.

The objectives relating to human resource development are to be achieved by supporting vocational education both within the formal and non-formal education systems, which includes courses and training. In addition, so-called skills initiatives are planned, based on recognising learning outcomes achieved outside of formal education. These are competences acquired both through the non-formal education already mentioned as well as through informal learning, by working independently with available resources as well as through webinars and online guides. Knowledge and skills acquired through the accumulation of experience in a given field also count (Monitor Polski of 2017, item 260). Thus, it has been

recognised that the education system should be oriented towards learning outcomes and not, as has been to date, on how they are obtained.

This is the context in which the Polish Integrated Qualifications System (IQS) is being implemented, whose functioning is regulated by the Act of 22 December 2015 (Journal of Laws of 2020, item 226), hereinafter referred to as the IQS Act. One of the main tools of the IQS is the Polish Qualifications Framework (PQF):

> *The PQF has eight levels of qualifications, like the European Qualifications Framework. Each PQF level is described by general statements*[1] *about the learning outcomes required for a given qualification level. In determining a qualification's PQF level, it does not matter whether its required learning outcomes are attained within a structured education system or in another way. PQF level descriptors describe the full range of qualifications' required learning outcomes in the categories of knowledge, skills and social competence. The descriptors of successive PQF levels reflect the increasing requirements in these areas* (Chłoń-Dominiczak et al., 2017, p. 4).

The IQS is the institutional foundation facilitating the implementation of the LLL concept by providing the appropriate terms, methodology and tools. The system does not create barriers to any form of education, and makes it possible to systematise the various qualifications that can be attained in Poland. Until now, qualifications had been awarded in different structures, institutions and organisations on the basis of various regulations and laws, so it was difficult to compare them using uniform criteria. The IQS is especially valuable in its ability to now include those qualifications operating in the free market, to describe them in the language of learning outcomes and to have them guaranteed by the state (based on the general principles of the inclusion and functioning of qualifications in the system) through the principles of validation[2] and quality assurance. The functioning of the IQS should therefore encourage lifelong learning and facilitate the development of competences in line with a person's own interests or labour market demand.

In accordance with art. 11 of the IQS Act, selected descriptors, those known as second stage PQF descriptors for vocational qualifications, can be further elaborated by developing sectoral qualifications frameworks (SQF), which reflect the specificity of a given industry. The sectoral qualifications framework is defined in the IQS Act as a description of the levels of qualifications functioning in a given sector or industry. SQFs are developed for those areas of activity when such a need arises. The main idea adopted in the development of sectoral frameworks is that they are created "by the sector for the sector". This means that the widest possible range of stakeholders is involved in the process of developing the framework. These include companies active in a given sector, chambers and industry organisations, representatives of higher education and vocational education and training, as well as regulatory institutions. Developing a framework starts with discussions about the competences and qualifications in the sector and allows for an exchange of information between

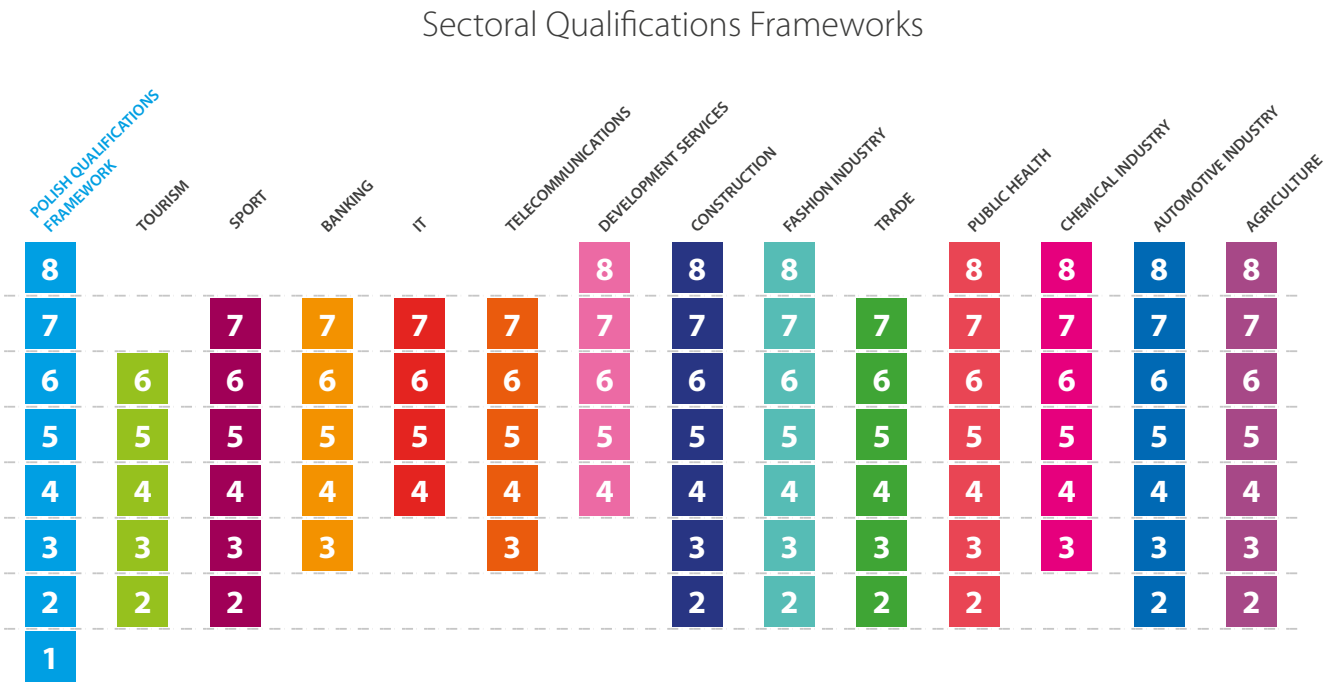
[1] Translator's note: known as descriptors.

[2] Confirming that a person seeking to have a given qualification awarded has attained a distinguished part or all of the learning outcomes required for that qualification, regardless of how they were learned.

the sector's representatives. Industry stakeholders are therefore both the creators as well as the recipients of the solutions of the resulting sectoral framework. A team of experts from a specific industry creates a draft SQF, which is then consulted within the sector. One of the most important elements of the work on an SQF is defining the key areas of the sector's activities, known as the sectoral determinants, which present the competence areas important to the sector. This then helps in determining the descriptors of specific levels, which (as in the PQF) can be arranged in series. They must correspond to PQF levels, but the components of their description should reflect the specificity of the given sector. The SQF could include all the levels of the PQF, but past work indicates that the number of described levels depends on the specific needs of the sector and is decided by its representatives.

Currently, work has been completed on proposed SQFs for the following sectors: banking, IT, sport, tourism, telecommunications, construction, development services, fashion industry, trade, public health, chemical industry, agriculture and the automotive industry. The range of these frameworks' levels is shown in Figure 1.

Figure 1. Levels of Sectoral Qualifications Frameworks.



Sectoral qualifications frameworks are included in the IQS by means of a regulation issued by the minister coordinator of the IQS (Minister of National Education). The SQF inclusion process is begun by the minister with jurisdiction over the sector, either at his/her initiative or at the request of a Sector Skills Council or interested party, if the initial assessment of the advisability of including the sectoral qualifications framework in the Integrated Qualifications System is positive (article 11, paragraph 2). So far, the sectoral frameworks for the sport, tourism, construction and development services sectors have been included. The IQS Stakeholders Council has also positively assessed the inclusion of the sectoral qualifications frameworks for banking and telecommunications.

To summarise, it can be stated that there are many benefits of developing an SQF, the most important of which is the fact that it is the result of dialogue among representatives of a given industry. This allows them to develop many new and universal solutions and to improve the description and inclusion of qualifications into the IQS, as the SQF translates the language of the PQF into one specific to the industry. The SQF also makes it easier to understand how to relate PQF descriptors to a particular sector, which in turn facilitates the accurate assignment of a PQF level to a specific qualification.

Work is currently underway at the Educational Research Institute (IBE) to develop additional sectoral frameworks, for example in the energy and mining sectors. It is worth noting that the concept of developing many sectoral qualifications frameworks and integrating them into the system in Poland emerged as one of the first in Europe. Currently, a similar solution is being implemented in Latvia, while other countries are working on their own versions.

This publication presents information on the development project of the Sectoral Qualifications Framework for the Chemical Industry (SQF Chem). It includes information about the sector, the context of developing the framework, a description of project work and the methodology used, the framework structure, recommendations for its implementation and use in Poland as well as a glossary of the industry terms applied. An annex to the publication presents the level descriptors of SQF Chem.

This publication was produced during the work of the SQF Chem project by a consortium of EPRD Biuro Polityki Gospodarczej i Rozwoju Regionalnego Sp. z o.o. [EPRD Bureau of Economic Policy and Regional Development LLC] and Stowarzyszenie Inżynierów i Techników Przemysłu Chemicznego [Polish Association of Chemical Engineers SITPChem].

2. The context of developing the SQF for the chemical industry

2.1. The context of the chemical industry in Poland

The need to develop a Sectoral Qualifications Framework for the chemical industry has been supported by many arguments. Currently, according to the classification of Statistics Poland,[3] the industry includes the production of: chemicals and chemical products, pharmaceuticals, rubber and plastic products (the "chemical segment") and refined oil products ("fuel segment"). The chemical industry is one of the key sectors of the economy, characterised by dynamic development, significant human resources potential and extensive possibilities of generating innovations. It is closely linked to other branches of the economy, such as the automotive or construction sectors. Therefore, the state and direction of the chemical industry's development affects other, key industrial segments. The Polish chemical industry is considered to be the leader in the region of Central and Eastern European countries (GUS, 2016; PIPC, EY, 2017).

When referring to the data collected by Statistics Poland and the Polish Chamber of the Chemical Industry, one can see the specificity and importance of this sector for the Polish economy and labour market. The size of the value of sold production places the chemical industry in second place in Poland and third in terms of employment – it employs about 300,000 people. This is almost 11% of Poland's total employment in industry, more than in the automotive or mining sectors (PIPC, EY, 2017).

The Polish chemical industry is developing dynamically against the backdrop of the world's largest economies. For example, the growth of this sector's sold production has been greater in recent years than in Germany, France or the USA. Apart from macroeconomic indicators, the role of the chemical sector in the national economy is evidenced by the omnipresence of chemical industry products. They are present in every area of life, and most daily activities require their use. The structure of this sector includes both large corporations – producers of mass chemicals and fuels – and smaller chemical installations. However, small and medium-sized enterprises make up a large majority of the total number of businesses in the chemical sector, numbering about 11,000 in Poland (PIPC, EY, 2017).

As the industry's experts note, the chemical sector is also characterised by relatively high investment outlays. In 2015 alone, they exceeded PLN 8.8 billion (Gazeta Finansowa, 2017). This is because this branch of industry needs investments in technologies, mainly innovative ones, for both stability and development. For several years now, Polish entrepreneurs have been increasing the level of introducing innovations in this sector. According to Statistics Poland, in 2014-2016, as many as 65% of chemical industry companies implemented innovative processes in their installations, and the level of expenditures on innovative solutions amounted to

[3] Translator's note: Poland's central statistical office.

around 2.2 billion PLN (PIPC, EY, 2017). There are several reasons why the sector invests in innovation. Many of these innovations are related to the development of pro-ecological solutions that contribute to sustainable development. For many years, the chemical industry in Poland has been shaped to a large extent by the need to adapt to EU regulations, laws and standards, which caused a significant increase in the costs incurred in the industry. Installations needed to be modernised, systems implemented to rapidly identify and monitor threats to production safety as well as the distribution of chemical products. The next important factors determining the state of the industry are prices and ensuring the supply of raw materials for basic production and energy needs. This was already being referred to in 2015, when experts from Roland Berger and BDI wrote that access to cheap raw materials, the formation of new chemical clusters outside Europe or the relocation of production to Asian countries were among the five key factors having a decisive impact on the future of the sector (Roland Berger, BDI, 2015).

The processes described above are conducive to a reorientation of the industry towards specialisation and the individualisation of production, which is combined with the need to analyse consumer trends and adapt chemical products to the needs of specific customers. This is a trend that can encompass the entire chemical industry, both large corporations and firms classified as small and medium-sized enterprises. Chemical industry customers have increasingly higher expectations, require additional services and greater functionality of purchased products, which leads to improvements in the technological solutions and increased expenditures on innovation. These are also more stable customers, and the profitability of this segment is also much higher (Chemia i Biznes, 2015).

The above described trends and the need for transformation within the sector are closely related to the need for investment, also in high quality personnel. Such conclusions are drawn from the research conducted by the Polish Chamber of the Chemical Industry, where the greatest challenges include, among others, improving innovation. In turn, one of the key activities which should lead to achieving this objective is the acquisition and education of qualified personnel. There are few current reports and publications providing in-depth information on the situation of personnel in the sector and the demand for competences. The last were in a 2012 report prepared for the then Ministry of Economy "The Chemical Sector in Poland". The authors of the publication, writing about the structure of employment, signalled two main problems relating to human resource challenges in the industry: first, very low – in relation to the rest of the European Union – average labour costs per industry employee, especially in relation to their very high productivity and, second, a mismatch between the structure of education for the sector and existing demand (Departament Informacji Gospodarczej, 2013).

In conclusion, the chemical industry is a significant employer and should also be given due attention in this context. Especially as the data to date are indicating a further increase in employment levels in this segment of the economy. This is an industry whose dynamic development and transformation is inevitable, which has a significant impact on the competence profile and structure of hired employees. The need to constantly modernise installations, implement safety systems, adjust to environmental requirements and regulations and the specialisation of the industry are the main trends and challenges for this domestic sector. This will most

probably involve the need to employ highly qualified and often narrowly specialised employees, capable of generating innovations, regularly updating their knowledge and ready for the changes awaiting the chemical industry in response to market requirements and European Union regulations.

2.2. Premises and aims of the project

In response to the described trends and directions of development within the industry affecting the competence profile of employees, the Sectoral Qualifications Framework for the Chemical Industry was created. The mission of developing the framework was to prepare an accessible and simultaneously versatile tool, which would allow for the competences and qualifications functioning in the industry to be distinguished, named and organised. SQF Chem develops and details second stage PQF level descriptors typical for vocational qualifications, translating the content of the entries into the language of the industry. In practice, this means describing and systematising the knowledge, skills and social competence by the different levels of advancement and complexity occurring in the sector.

In addition to the main objective, which was to prepare SQF Chem, the project also developed a definition of the sector, a glossary of the terminology used in SQF Chem, instructions for reading the descriptors and recommendations for future uses of SQF Chem.

In applying the industry's language, which makes use of the entries in the PQF, employers can better and more adequately know which competences are missing in their workplace and what they should expect from their employees in terms of preparation. On the other hand, for employees, this can facilitate a better understanding of the needs of employers and help them assess their own competences in terms of career planning. The development of SQF Chem enables qualifications to be compared and creates the conditions for the professional mobility of employees in the sector.

It can also facilitate the development and inclusion of market qualifications in the IQS, providing an opportunity to formally validate competences acquired through both training and work experience. It will therefore respond to the need to recognise the learning that occurs in the workplace or is obtained from training providers.

2.3. Entities and persons involved in developing the proposed SQF Chem

The basic methodological assumption guiding the creation of the sectoral qualifications framework is contained in the phrase "by the sector for the sector". This means that no framework can be developed in isolation from the sector's community, represented by its stakeholders. Experts with specialist knowledge of the chemical industry sector were involved in developing SQF Chem. Their expertise was, among others, on the structure of the industry's companies and the relationships among them; the competences required

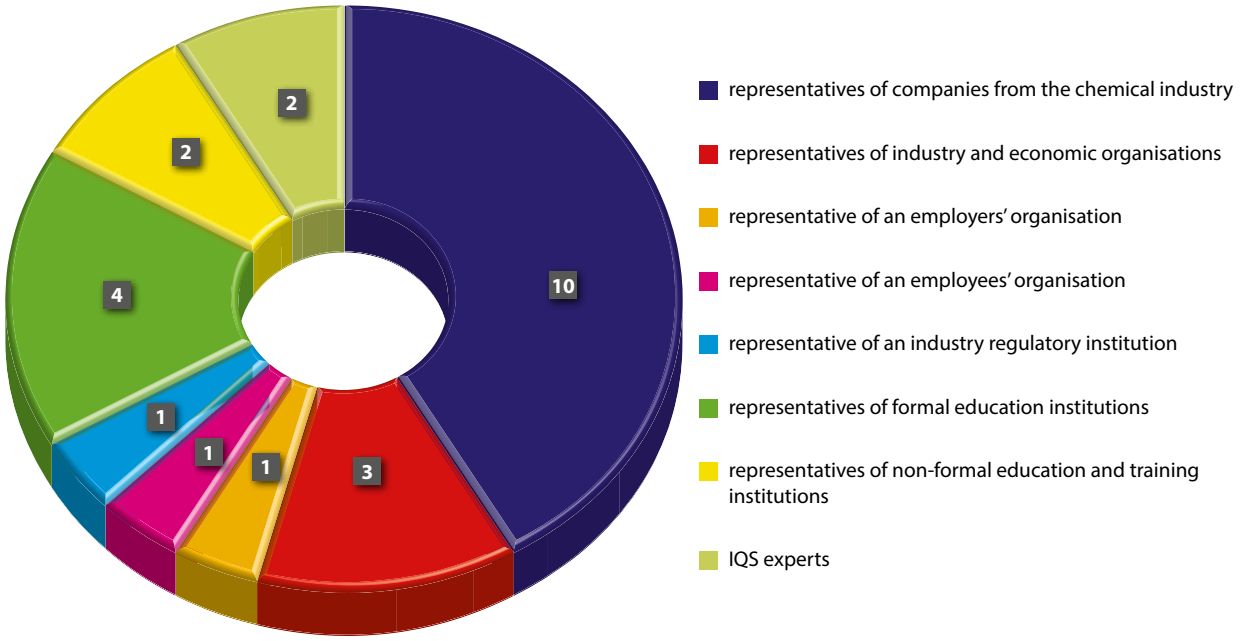
from employees, including those involved in production processes, as well as the most important qualifications awarded in the chemical industry in Poland and/or abroad.

The expert team consisted of people specialising in various areas of the chemical industry. They represented companies operating in the areas of mass chemical production, chemical processing, producing fuels and oil refinery products as well as low-tonnage chemical production. In addition, representatives of industry organisations, chambers of commerce, employers' and employees' organisations and institutions performing oversight functions were involved. Persons from institutions providing formal and non-formal education and training were also invited to work on the project.

Methodological experts, specialising in issues relating to the implementation of the Integrated Qualifications System, were also involved, in particular those with experience in developing sectoral qualifications framework projects for other sectors.

The structure of the team is presented in Figure 2.

Figure 2. Structure of the expert team involved in the process of developing the proposed SQF Chem.



The team was headed by Docent Małgorzata Petzel, PhD, Director of the Institute of Chemistry at the Faculty of Construction, Mechanics and Petrochemistry of the Warsaw University of Technology. The members of the expert team and their brief curriculum vitae are presented in Table 1.[4]

[4] The table does not include the names of all the members, only those who allowed us to identify them and publish their biographical notes.

Table 1. Expert team members.

Lp.	Name	Biographical note
1.	Józef Kozieł	Vice-President of the Executive Board of the Polish Association of Chemical Engineers SITPChem. Member of the Board of the Polish Chamber of the Chemical Industry. Lecturer of Postgraduate Studies at Cracow University of Technology. Secretary General of the Federation of Associations of Technicians for Industry of Paints in European Countries (FATIPEC) based in Paris. A graduate of the Faculty of Chemistry at the Silesian University of Technology and Business Studies in Yokohama and Tokyo.
2.	Stanisław Gruszka	Former purchasing director of Polifarb Cieszyn-Wrocław S.A., Vice-President of the Executive Board of Eurochem Service Polska and President of Forchem. A graduate of the Silesian University of Technology, Faculty of Technology and Chemical Engineering.
3.	Adam Tarniowy	Doctor of Chemical Sciences at the Rtm. Witold Pilecki State Higher Vocational School in Oświęcim. President of Retinall Ltd. company.
4.	Marcin Fidecki	HR Director of PKN Orlen S.A. responsible for personnel management, including effectiveness, personnel costs, employment and portfolio projects. Previously he held HR director positions at PKO BP, PWC and elsewhere.
5.	Ryszard Puławski	Scientific and technical staff person at the Warsaw University of Technology in the Department of Chemistry and Organic Technology of the Institute of Chemistry, co-owner of PETROL, which was entered in the register of Innovation and Implementation Units. Author of numerous patents.
6.	Prof. Jacek Kijeński, PhD, Eng.	President and honorary member of the Polish Association of Chemical Engineers SITPChem. In 1993-1999, Chairman of the Commission of the Minister of National Education for Training in the professions for the chemical industry, then a member of the World Association of Industrial and Technological Research Organizations (WAITRO) and its representative for Central and Eastern Europe. Since 2003, he has been a member of COCI IUPAC, and in 2003-2006, he was a member of the Inter-ministerial Team for the Ownership Transformation of Research and Development Units and the Tripartite Team for the Chemical Industry appointed by the Minister of Economy, Labour and Social Policy. Vice-Chairman of the Committee on Chemistry of the Polish Academy of Sciences, member of the Council of the Polish Chamber of the Chemical Industry – Employers' Union, representative of the Minister of Economy and Labour in the Commission for Industry and Enterprise Development of the United Nations Economic Commission for Europe, and member of the Scientific and Technical Committee of NOT [the Central Technical Organization].

Lp.	Name	Biographical note
7.	Tomasz Zieliński	President of the Board of the Polish Chamber of the Chemical Industry. He is responsible for the overall work and development strategy of the most important institution representing the chemical sector in Poland, both in national and international fora. He is a chemical expert with many years of experience in the most important companies of the chemical and petrochemical sector in Poland and Central Europe.
8.	Jacek Drożdżal	President of the Management Board of the West Pomeranian Chemical Cluster "Green Chemistry" [Zachodniopomorski Klaster Chemiczny "Zielona Chemia"]. He is an animator and practitioner in creating business cluster initiatives. He is experienced in implementing projects at the interface between science and business. He represents the Cluster in national and international bodies and promotes its activities.
9.	Robert Szyman	General Director of the Polish Union of Plastics Converters [Polski Związek Przetwórców Tworzyw Sztucznych], representing the Union since 2017 in the Working Group of the National Smart Specialisation – The Circular Economy – Water, Fossil-based Raw Materials, Waste. Since 2018, an expert of the European Economic and Social Committee to the European Union in the field of plastics regulations.
10.	Maciej Musiejko	Legal counsel, graduate of the University of Gdańsk. Specialist in analyses and control of the liquid fuels market in the Northern Territorial Division of the Energy Regulatory Office.
11.	Dr. Eng. Aneta Lorek	Research and teaching staff member, Assistant Professor, Deputy Director for General Affairs at the Institute of Chemistry of the Warsaw University of Technology, Faculty of Construction, Mechanics and Petrochemistry in Płock. Co-author of the article "Chemical technology engineer, and who would that be?", which appeared in the "CHEMIK" monthly journal.
12.	Barbara Kozera	Chemistry teacher, propagator of education for children and youth and Deputy Director of the School Complex of the Ignacy Łukasiewicz Education Centre in Płock. One of the organisers of cyclical events for primary and middle school students "On Vacation with Chemistry".
13.	Krzysztof Kołaciński	Director of the Ignacy Mościcki Technical School Complex in Tarnów, which provides vocational education in 7 professions. Pioneer in establishing extensive cooperation between the vocational school and industry. The school's main partner is one of Europe's largest chemical concerns – Grupa Azoty S.A. in Tarnów. The school also cooperates with the chemical faculties of the Rzeszów University of Technology and the State Higher Vocational School in Tarnów.
14.	Natalia Jasińska	Graduate of chemical and pedagogical studies at Jan Kochanowski University in Kielce. Active teacher, owner of a company working on education in chemistry for all levels of education. She worked as the main specialist in the quality control of construction chemistry.

Lp.	Name	Biographical note
15.	Magdalena Słocińska	Methods expert, coordinator, trainer. Specialises in issues relating to the functioning and development of the Integrated Qualifications System. Manages projects in the area of the labour market and education, has preparation as a trainer and experience in conducting training, seminars and workshops. She took part in developing the Integrated Qualifications System, including work on its pilot implementation. She has experience in competence analysis and developing sectoral qualifications frameworks for the fashion industry and agriculture.
16.	Anna Araminowicz	Methods expert specialising in issues relating to the functioning and development of the Integrated Qualifications System. Experience in developing the Integrated Qualifications System, including work on its pilot implementation. She was involved in developing and testing solutions for the quality assurance of the qualifications system. She has experience in developing procedures and solutions for public administration in the area of educational services. She took part in activities relating to competence analyses and developing sectoral qualifications frameworks (e.g. for the fashion industry and agriculture).

Work on developing the proposed Sectoral Qualifications Framework for the chemical industry was conducted by the consortium of EPRD Bureau of Economic Policy and Regional Development Ltd. and the Polish Association of Chemical Engineers.

EPRD Bureau of Economic Policy and Regional Development Ltd. is a consulting company providing consulting and training services for the public sector, international corporations, SME sector companies and non-governmental organisations for over 20 years. It works towards the development of broadly understood entrepreneurship in Poland and worldwide. On a daily basis, its team of permanent specialists in consulting and project management is supplemented by experienced experts from abroad – outstanding professionals, scientists and practitioners. The international cooperation it is engaged in allows for the transfer of knowledge and best practices between implemented projects. Among the projects completed so far, worth noting are the expert opinions, analyses and feasibility studies conducted for the largest Polish companies in the chemical sector.

The Polish Association of Chemical Engineers SITPChem continues the activities of the Association of Chemical Engineers of the Republic of Poland founded in 1927. The activities of the Association are aimed at professional chemists, supporting the development of the chemical industry, as well as promoting the social and economic importance of engineering and technical personnel. Efforts and initiatives of the Association are addressed to the community of chemists, serve the chemical industry and science, environmental protection and the maintenance of a good image of chemistry in society. The organisation owns three journals: CHEMIK nauka-technika-rynek [CHEMIK science-technology-market], Przemysł Chemiczny [Chemical Industry] and Ochrona Przed Korozją [Corrosion Protection]. The Association is headquartered in Warsaw and operates in 23 branches throughout Poland.

3. Organisation and methodology of working on SQF Chem

The process of developing the proposed SQF Chem used various methods. The combination of these methods served the purpose of performing a multi-faceted analysis of the sector in terms of its competences, and then systematising the collected material in the best possible way and developing tools deemed useful for the industry. Work on developing SQF Chem was performed in accordance with a specified methodology, whose stages are illustrated in Figure 3. What is important in this case is the order and sequence of conducting the work and thoroughly developing the specified objectives at each stage. It is worth emphasising that an important stage of the SQF Chem project is its wide consultations. This is the moment when comments are collected from the community of the industry, which allows the obtained results to become even more relevant and useful for the sector.

Figure 3. Developing the proposed SQF Chem – stages of the substantive work.

1. Analysing competences
2. Determining professional processes and tasks and identifying the competences that should be included in qualifications typical for the chemical industry
3. Distinguishing the sectoral determinants
4. Formulating the level descriptors
5. Developing the final definition of the sector
6. Analysing the compatibility of SQF Chem with the PQF

The next part of this publication presents the details of the work conducted, the concept and methodology, which allowed the experts to make the final decisions on the form of SQF Chem.

3.1. Analysis of competences

The first stage of work on the proposed SQF Chem was the analysis of competences in the sector. This served to identify the processes, tasks, activities and key competences of the sector, which at further stages were translated into the language of learning outcomes and assigned to PQF levels. In order to conduct this analysis, 4 focus group interviews were organised, which enabled us to obtain a multidimensional diagnosis of the competences essential for various processes and tasks to take place in the sector. In accordance with the premises, the focus group participants represented the labour market and had detailed knowledge about the processes implemented in the chemical industry and its needs for competences and qualifications. Between 5 and 9 respondents participated in each of the interviews, and included:

- representatives of large enterprises in the chemical industry, varied in terms of their business activities, able to convey the qualitative needs of the entire industry,
- representatives of SMEs from the chemical industry, diversified in terms of their business activities,
- representatives of organisations working on behalf of the chemical industry, i.e. industry organisations, organisations of employers and employees,
- representatives of the formal education sector at secondary and higher levels,
- representatives of business institutions of the chemical industry (representative of the Chamber of Commerce).

A total of 28 representatives of the chemical industry took part in the interviews. The focus groups were divided thematically, i.e. each had persons representing a specific area of the sector, regardless of the size of the company or type of entity (companies, industry organisations, universities, schools). This made it possible for people who are specialists in similar areas but have different perspectives to meet during one interview. In the course of further work, it was possible to compare these areas and to check if and how they differ from one another.

The following methodological schema was used to analyse the competences:

1. distinguish key processes, tasks and activities implemented in the sector,
2. determine the competences essential for the implementation of key tasks and activities in the sector,
3. verify the identified competences,
4. develop a list of key competences.

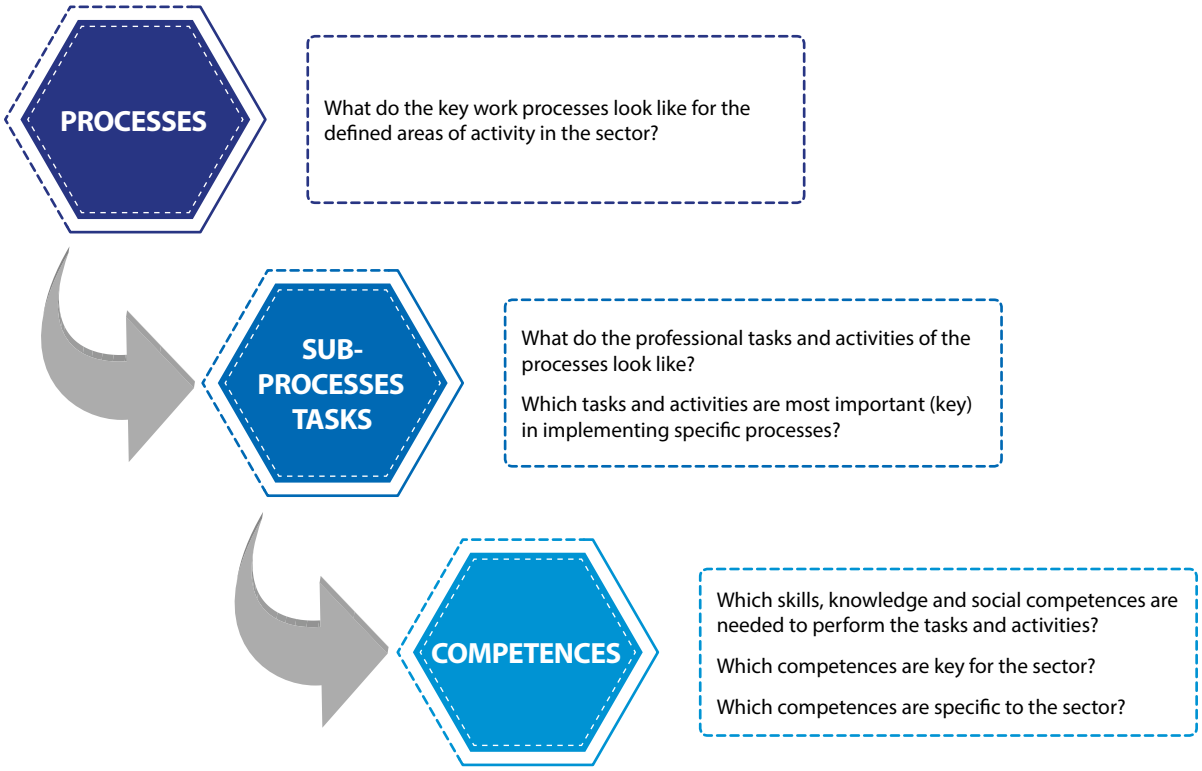
The schema consisted of three modules – an introduction and two dedicated to the following research objectives:

1– identification of implemented processes, tasks and activities and the competences used,

2 – identification of professions, job positions and qualifications in the chemical industry.

The implementation of the first objective made it possible to identify the processes, key tasks and activities implemented in the sector, which was the basis for further work on the competence analysis. Focus group participants were also asked about the competences needed to perform the identified tasks and activities. The second research objective served to partially identify key professions, job positions and qualifications, which were included in further analyses. The course of the interview is presented in Figure 4.

Figure 4. Diagram of the first part of conducting the focus group interviews.

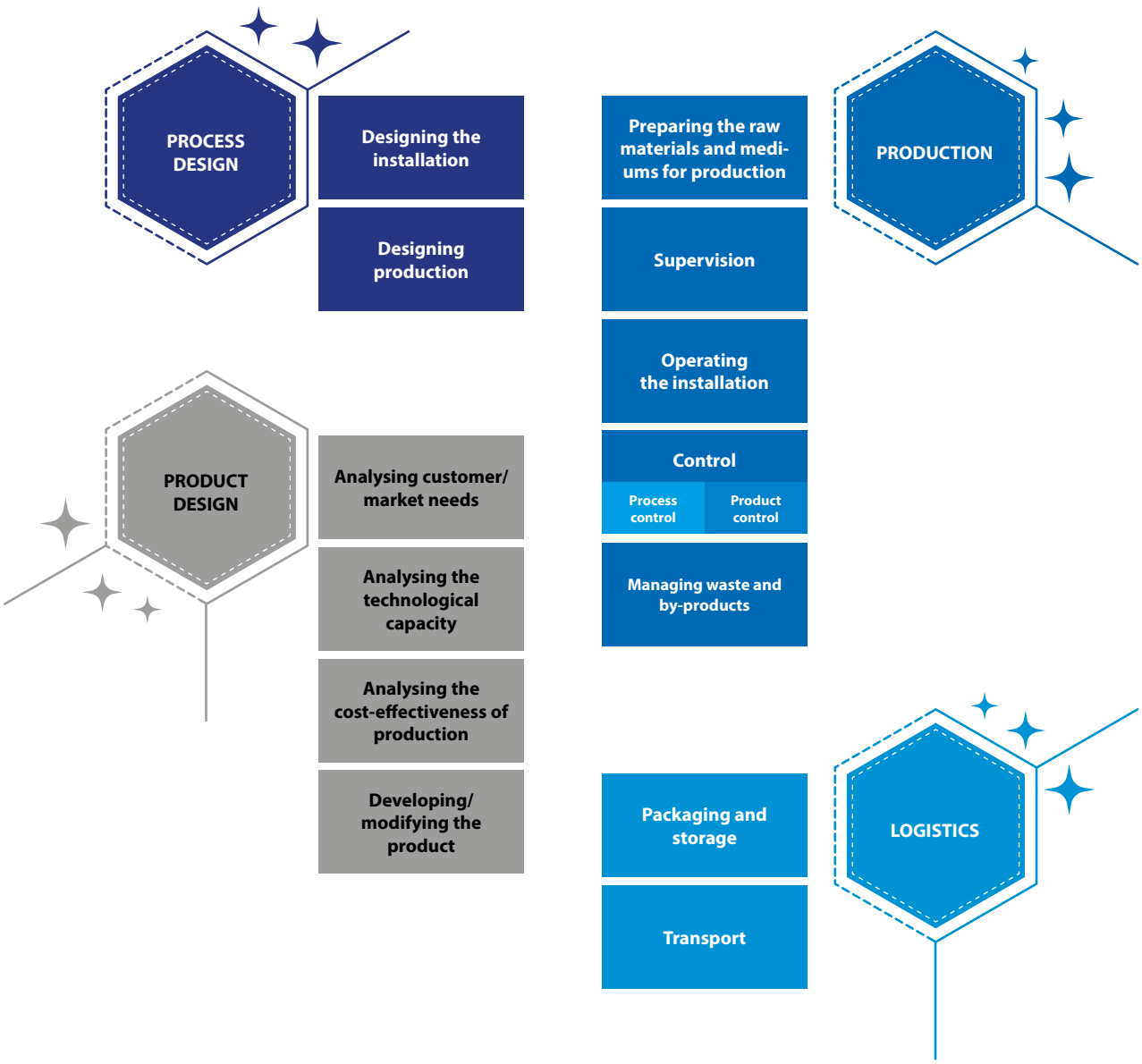


An important element of the competence analysis was also the work of the experts. Initially, at the first stages of the analysis, this work had a workshop character, and was connected with the course of the focus group interviews (FGI). After developing the findings from the analysis of existing data, the resulting analytical material was verified by all members of the expert team. In the course of the discussion, the material was further refined and finally unified.

3.2. Determining the processes and professional tasks as well as identifying the competences that should be included in qualifications typical of the chemical industry

As described earlier, the work undertaken served to identify the professional processes, sub-processes and the tasks that comprise them. Their list, presented in Figure 5, is an intermediate stage, which made it possible to identify and develop the list of competences used in the sector.

Figure 5. List of processes and sub-processes distinguished in the analysis of competences in the chemical industry.



As shown in Figure 5, examples of professional processes identified during the FGI were: "process design", "product design" or "logistics". At this stage, smaller sub-processes or even professional tasks such as "designing the installation" in "process design" or "analysing technological options" in "product design" were identified and named. This stage illustrates the logic adopted for the work, which made it possible to move to an ever lower level of operations taking place in the sector. This enabled the identification of the competences required in the actual conditions of professional work.

The material prepared in this way was then verified by the whole expert team. The main objective was to confirm whether the assigned competences are needed and sufficient to perform the processes/sub-processes. On this basis, the list of key competences was produced.

The competence analysis conducted for SQF Chem also became the basis for developing the list of qualifications typical for the chemical industry, which, due to organisational constraints, is not included in this publication. While developing the list, the frequency of the occurrence of competences in the processes and sub-processes distinguished in the sector was taken into account. The most frequently occurring competences are those that are required to perform the largest number of identified activities.

The results of the analysis were then consulted with experts. The verified elements included the completeness of the list and the validity of the competences identified. This meant that the experts had the opportunity to remove and add important competences to the list, which had been omitted at an earlier stage. An important criterion for the verification of key competences was the fact that they function independently of the size of a company, type of chemical production, as well as the specificity of various jobs, which remain characteristic for the chemical industry.

The next step was to organise and group the most commonly occurring competences. The main purpose of distinguishing the competences that should be used in qualifications typical for the sector was to indicate the areas that should be taken into account when describing each qualification in the chemical industry. In this way, four main areas were identified:

1. safety,
2. environmental protection,
3. handling chemicals,
4. following procedures.

3.3. Distinguishing the sectoral determinants

To identify the sectoral determinants, the methodology uses such categories as:

- key work processes,
- work "objects" – everything that a person impacts when performing tasks within a given process (products, processes, phenomena, costs as well as people and their mutual relations),
- tools, methods and work organisation – including the selection and use of tools, technologies, methods and forms of work organisation,
- requirements of the work and technology – standards, rules and laws relating to selected processes, but also the requirements of end users (buyers of products and services).

The categories above were referenced to the identified competences, allowing eight contexts to be identified that are specific to the entire chemical industry. In the course of the discussions, the proposed contexts were clarified and considered relevant for the sector. The identified contexts are presented in Table 2.

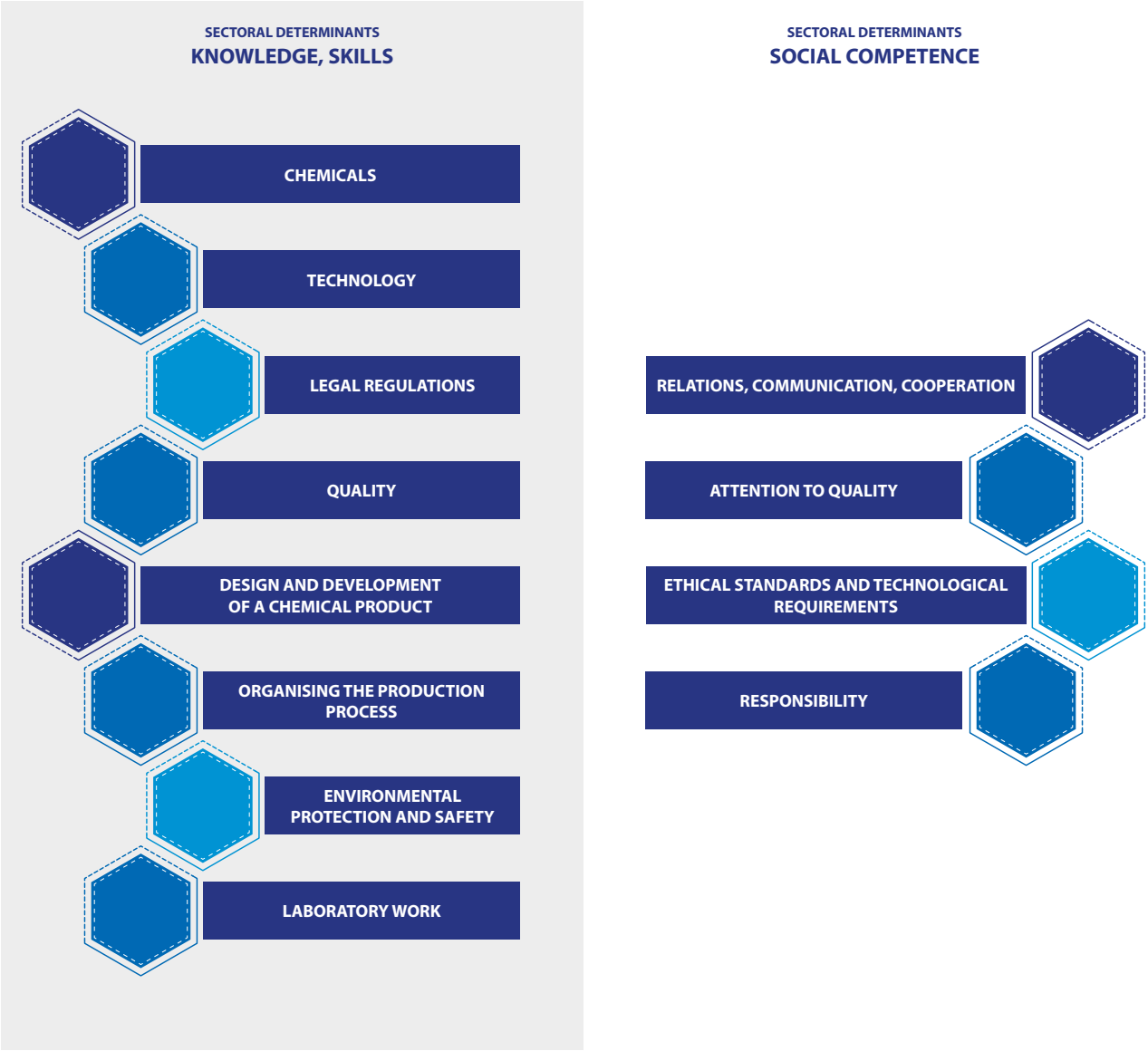
Table 2. The contexts of the chemical industry distinguished in the analysis of competences.

CONTEXT	SCOPE OF COMPETENCES WITHIN THE CONTEXT
product design and the organisation and optimisation of the production process	Competences in such areas as product development and modification, technology design, work organisation (organising workstations, developing schedules, plans, procedures, etc.), production optimisation (installation costs and efficiency, among others).
quality control	Competences in such areas as controlling work (one's own and that of others), product and process control.
product requirements	Competence in such areas as product properties and safety, customer requirements, product certification processes, etc.
market conditions	Competences in such areas as the analysis of suppliers, customers, prices, availability of technologies and raw materials.
raw materials	Competences in such areas as the properties of raw materials and how to handle them.
technology	Competences in such areas as operating machines and using production methods and techniques.
environmental protection	Competences in such areas as the circular economy, the environmental impact of the sector, handling production waste.
safety	Competences in such areas as occupational safety and the safety of the technological process.

Distinguishing the contexts allowed us to organise and identify the competences. The contexts were therefore the starting point for determining the sectoral determinants of SQF Chem. On the basis of the results of the competence analysis and indicated contexts, the expert team distinguished the sectoral determinants, which were subject to consultations in the broader community of the chemical industry.

Community representatives commented on the determinants to further clarify them or change their names, but no remarks were made on the need to identify additional determinants. In the next stage of consultations, the determinant "laboratory work" and "legal regulations" were added. The final list of the formulated determinants are presented in Figure 6.

Figure 6. Sectoral determinants of SQF Chem.



3.4. Formulating level descriptors

In order to ensure that SQF Chem complies with the premises of the Integrated Qualifications System and is useful for chemical industry stakeholders at the stage of constructing the level descriptors, the following assumptions were made:

- SQF Chem descriptors will further elaborate PQF descriptors and will be able to be referred to in the process of describing qualifications,
- the descriptors will be formulated in the language of learning outcomes, organised by the categories of knowledge, skills and social competence,
- the descriptors will illustrate the progression of key chemical industry requirements in the areas of knowledge, skills and social competence,

- individual components of the level description will be structured in a way that defines the minimum competences a person must have and will only define the verifiable competences required to perform sector-specific tasks of a specific degree of difficulty,

- SQF Chem level descriptors will be relevant to the specific characteristics of the chemical industry, will be derived from the competence analysis, and will take into account, among others, the key competence groups required to work in the chemical industry as well as the most important qualifications awarded in the sector.

Developing the SQF Chem level descriptors was based on the *Analysis of competences in the chemical industry* [Analizie kompetencji w sektorze przemysłu chemicznego], the knowledge of experts and ensued from the identification of key competences.

First, the distinguished key competences were assigned to relevant sectoral determinants. Then, the level of detail of the descriptor entries was verified. What was important here was to ensure that the descriptors were written in a general enough manner to relate to the whole sector, regardless of the specifics of the individual activities within the sector or, for example, the size of the company. Due to the nature of sectoral qualifications frameworks as a tool, it was important that in using the necessary generalisations, the content of the descriptor was not too far removed from the specificity of the sector and its most important aspects were preserved.

Next, individual entries were grouped into series, i.e. sequences of related competences, differing in their degree of complexity (enabling the performance of increasingly advanced activities and professional tasks). Grouping into series was conducted separately for each competence category, i.e. knowledge, skills and social competence were grouped separately. Examples of series of SQF Chem descriptors are presented in Figures 7 and 8.

Figure 7. Example of a knowledge series.

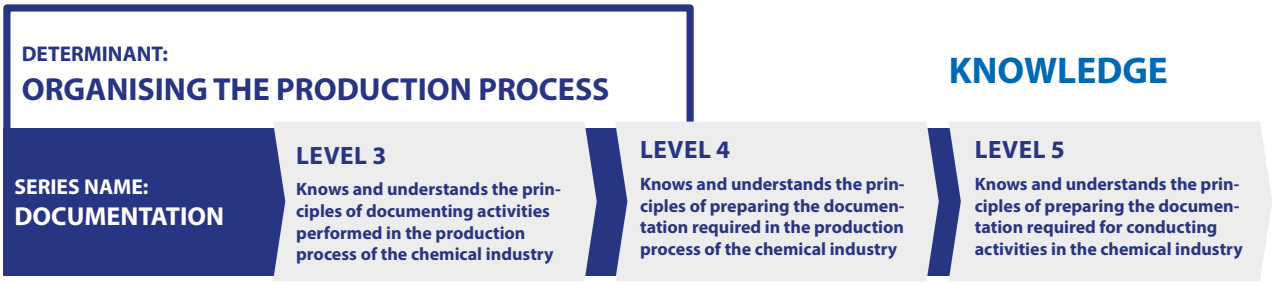
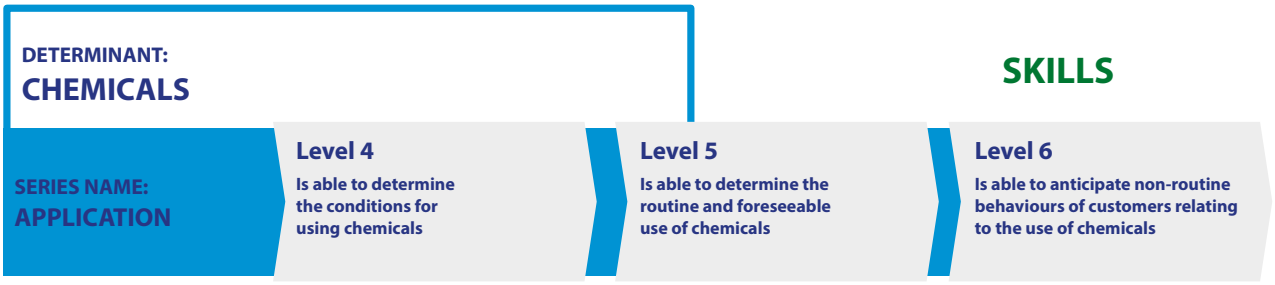


Figure 8. Example of a skills series.



3.5. Consulting the initial draft of SQF Chem

In order to ensure the best possible quality, substantive correctness and usefulness of the developed framework, the solutions adopted in SQF Chem were consulted in the wider industry community. Seminars were organised, qualitative research was conducted (individual in-depth interviews) and expert reviews of the prepared material were ordered. The consultation seminars were attended by 40 persons:

- 27 representatives of the enterprise sector (large and MSE),
- 5 representatives of sector-related institutions,
- 5 representatives of formal education,
- 3 representatives of non-formal education.

Individual in-depth interviews (IDI) were conducted with 10 representatives of the most important stakeholder groups representing various branches of the chemical industry, and reviews were obtained from 3 experts. The consultation process ended with a concluding seminar attended by 50 participants.

The consultation seminars had the character of a workshop and their key aspect was to discuss the adequacy of the sectoral determinants and SQF Chem level descriptors. The personal composition of the seminars was chosen to reflect, as much as possible, the diversity of the sector's stakeholders. The number of consultative groups (12-15 people) enabled an effective discussion to be held on the presented preliminary SQF Chem draft.

The qualitative research was conducted by means of individual in-depth interviews, with the aim of obtaining respondents' opinions on the adequacy of the developed definition of the chemical industry, the sectoral determinants, SQF Chem level descriptors and the extent to which this agreed with the expectations of the sector's stakeholders.

The expert reviews were an additional form of collecting opinions on the SQF Chem draft. The purpose of the reviews was primarily:

- to assess the adequacy of the adopted definition of the sector and the sectoral determinants,
- to verify the adequacy of the framework to the specific character of the sector and the transparency and completeness of the SQF Chem entries,
- to assess the usefulness of SQF Chem for the chemical industry,
- to collect recommendations for implementing and further developing SQF Chem.

The final stage of the consultations was a concluding seminar organised after holding the consultation seminars, in-depth interviews and reviews. During the

seminar, the recommendations of the industry community on introducing and operating SQF Chem were discussed and the results of the work and conclusions from the consultations were presented.

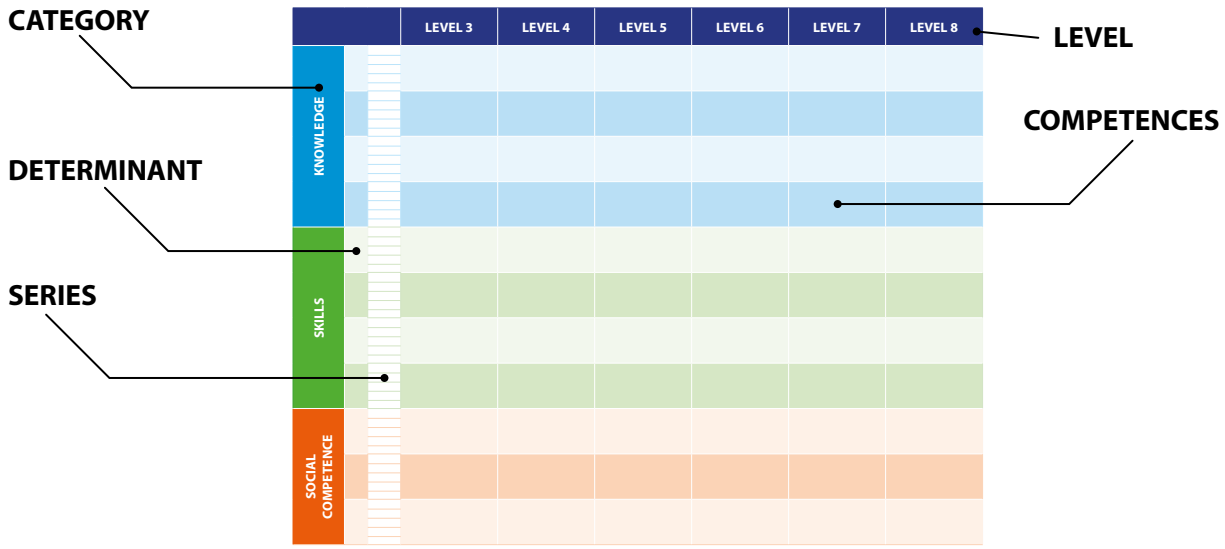
The proposed SQF Chem draft was additionally verified by the sectoral community in the Internet (April 2020) and by industry expert reports. This served as an assessment from the point of view of representatives of educational institutions, companies and industry organisations. The verification was positive – no comments or suggestions for changes to the proposed draft were submitted.

4. The structure of SQF Chem

The Sectoral Qualifications Framework for the Chemical Industry is a set of competences categorised by knowledge, skills and social competence, organised by their degree of complexity. In total, there are over 520 entries in SQF Chem corresponding to the identified key and sector-specific competences of the chemical industry. During the design of the Sectoral Qualifications Framework, a structure was adopted to ensure transparency and facilitate the search for specific entries. The elements of the SQF Chem structure are described below and graphically presented in Figure 9:

1. three categories: knowledge, skills and social competence,
2. sectoral determinants organising the competences by knowledge, skills and social competence,
3. series of competences,
4. SQF Chem levels corresponding to the levels of the Polish Qualifications Framework.

Figure 9. Structure of the Sectoral Qualifications Framework for the Chemical Industry.



Additional, integral elements of SQF Chem that facilitate its use are:

1. The definition of the sector indicating the general scope of the competences included in SQF Chem,
2. Descriptions of the sectoral determinants indicating the scope of the competences each determinant includes,
3. A glossary of terms used in SQF Chem.

4.1. Definition of SQF Chem

Preparing the definition of SQF Chem was based on the assumption that it should correspond to the scope of the chemical industry as well as to the specificity of the sectoral qualifications framework as a tool. Taking into account the above principles, a definition of SQF Chem was adopted that refers not only to the similarity of the products manufactured by the entities operating in the sector, but also to the key work processes implemented in the sector, their interrelationships and key competences for these processes.

The definition of SQF Chem that was finally developed is presented below:

> SQF Chem contains the competences for performing professional tasks in the areas of chemical product design, chemical analytics, as well as design, process optimisation, organising and conducting the production process of chemical products, taking into account quality, safety, environmental protection and aspects relating to the circular economy.
>
> Chemical products are understood as ready-to-use or semi-finished chemicals intended for further processing, which result from production processes based on controlled physical and chemical reactions, in particular those produced by the organic and inorganic chemical industry, including the coke industry, refineries, the petrochemical industry, fertilisers, plastics and rubber, paints and varnishes, construction chemicals, artificial and synthetic fibres, consumer chemicals, cosmetics, and protection products for plants.

4.2. Sectoral determinants of the chemical industry

Sectoral determinants ensure coherence and completeness within a sectoral qualifications framework. They group competences from a given area, which makes searching for them in SQF Chem intuitive. The description of the determinants is a key, enabling users to quickly find the entries being sought. Tables 3 and 4 describe the groups of competences that have been assigned to particular determinants.

Table 3. Description of the SQF Chem sectoral determinants – knowledge, skills.

KNOWLEDGE, SKILLS	
SECTORAL DETERMINANT	**The determinant includes competences relating to:**
CHEMICALS	▪ knowledge about chemical properties ▪ handling chemicals

KNOWLEDGE, SKILLS	
SECTORAL DETERMINANT	**The determinant includes competences relating to:**
TECHNOLOGY	▪ designing, optimising and modifying technological processes ▪ supervising and operating machines, equipment and apparatus ▪ the course of unit operations and processes ▪ knowledge of the theoretical basis of the technologies and terminology used in the industry ▪ using documentation, developing documentation, including design and technological documentation as well as documentation of the production process ▪ communication, decision-making and acting autonomously
LEGAL REGULATIONS (DETERMINANT DISTINGUISHED ONLY FOR KNOWLEDGE)	▪ knowledge of legal regulations on using, registering and introducing chemicals to the market ▪ knowledge of legal regulations on the protection of intellectual property rights ▪ knowledge of legal regulations on safety and environmental protection
QUALITY	▪ quality requirements and standards ▪ monitoring the course of the production process ▪ testing and assessing the properties of raw materials, semi-finished products, chemical products and technological mediums ▪ performing measurements and analytical studies ▪ developing control plans
DESIGN AND DEVELOPMENT OF A CHEMICAL PRODUCT	▪ developing and modifying the product ▪ conducting experiments, including as part of research and development (R&D), using information and the results of R&D ▪ defining and analysing customer needs
ORGANISING THE PRODUCTION PROCESS	▪ planning production ▪ determining the required raw materials, calculating the costs of production ▪ analysing production possibilities and cost effectiveness ▪ cooperating with suppliers and responding to conditions in sales markets ▪ analysing technological potential

KNOWLEDGE, SKILLS	
SECTORAL DETERMINANT	**The determinant includes competences relating to:**
ENVIRONMENTAL PROTECTION AND SAFETY	▪ ensuring the safety of the production process ▪ environmental protection, handling waste and by-products ▪ developing safety systems
LABORATORY WORK	▪ methods used in the laboratory ▪ supervising and operating the machines, equipment and apparatus used in the laboratory ▪ performing measurements and analytical studies ▪ conducting experiments ▪ using the documentation pertaining to work in the laboratory ▪ occupational safety in the laboratory ▪ managing and disposing of the waste generated in the laboratory

Table 4. Description of the SQF Chem sectoral determinants – social competences.

SOCIAL COMPETENCES	
SECTORAL DETERMINANT	**The determinant includes competences relating to:**
RELATIONS, COMMUNICATION, COOPERATION	▪ maintaining relations in the work environment and industry community ▪ communicating in the work environment, professional community and with chemical product customers ▪ cooperating in a team
ATTENTION TO QUALITY	▪ acting to ensure the quality of chemical products ▪ assessing one's own work and that of a subordinate team
ETHICAL STANDARDS AND TECHNOLOGICAL REQUIREMENTS	▪ complying with the requirements of the technology ▪ complying with ethical and professional standards and promoting them ▪ supplementing one's knowledge and skills relating to the development of production technologies
RESPONSIBILITY	▪ taking responsibility for the correctness, safety and results of one's activities ▪ taking responsibility for the safety of product customers ▪ taking into account the impact of activities on the environment ▪ acting autonomously in performing one's tasks, leading a team and making decisions

4.3. Competence series

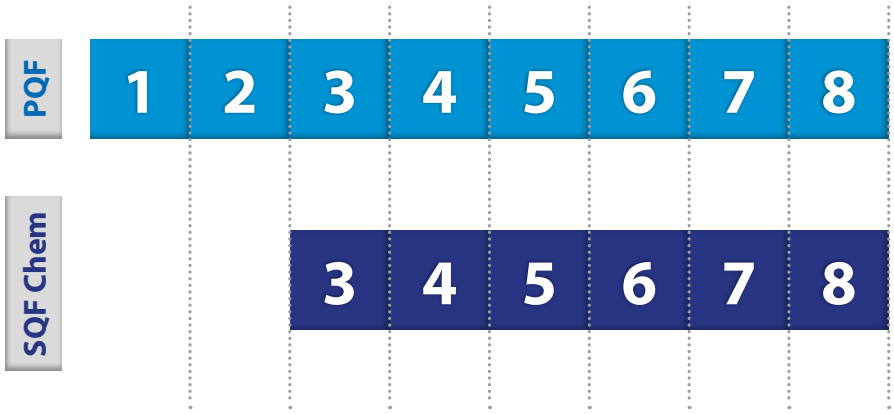
A competence series is a group of descriptors that defines the requirements for the same area at different levels. The competences belonging to the same series in SQF Chem are in the same row, making it possible to compare the complexity of the descriptors at different levels. Examples of series in SQF Chem are presented in chapter 3.4.

4.4. Referencing to the Polish Qualifications Framework

Art. 2 of the Act on the Integrated Qualifications System states that the SQF is *a description of the levels of qualifications functioning in a given sector or industry; the levels of a Sectoral Qualifications Framework correspond to the appropriate levels of the Polish Qualifications Framework*. The qualification level descriptors in sectoral frameworks are a further elaboration of the Polish Qualifications Framework level descriptors, but taking into account the specificity of a given industry or sector (Article 11, Act on the Integrated Qualifications System). In accordance with this Act, only a sectoral qualifications framework that has been referenced to the relevant PQF descriptors may be included in the IQS.

SQF Chem describes competences at levels 3–8 (Figure 10).

Figure 10. Referencing SQF Chem to the Polish Qualifications Framework.



4.5. Glossary of terms used in SQF Chem

We decided to use the simplest possible language in the level descriptors and avoid advanced descriptive terms. This meant that we needed to use general terms, which are defined in the glossary that is part of SQF Chem (Table 5). This preserved the clarity of the SQF Chem entries, while at the same time ensuring an appropriate degree of sectoral specificity in the SQF Chem descriptors.

Table 5. Glossary of terms used in SQF Chem.

GLOSSARY of terms used in SQF Chem	
CHEMICAL PRODUCTS	chemicals that are ready-to-use or intended for further processing resulting from industrial processes based on controlled physical and chemical reactions
CHEMICALS	chemical substances and mixtures thereof consisting of reagents, semi-finished products and products of the chemical industry as well as production waste and by-products
PRODUCTION PROCESS	all activities aimed at transforming raw materials and semi-finished products into products; the production process includes the technological process and ancillary activities (e.g. quality control, internal transport, storage)
TECHNOLOGICAL PROCESS	the part of the production process in which take place the preparation and chemical-physical treatment of raw materials and semi-finished products as well as the manufacture of products
TECHNOLOGICAL OPERATION	a separate part of the technological process conducted at one workstation by one employee or a team of employees
CHEMICAL PRODUCT DESIGN	all activities aimed at developing or modifying chemical product formulae, including those relating to R&D, taking into account the needs of chemical product customers

5. Recommendations on implementing and using the SQF for the Chemical Industry in Poland and its further development

From July to September 2019, representatives of the chemical industry participated in consultations held on the preliminary draft of the Sectoral Qualifications Framework. Independently of the comments provided on the draft itself, they also presented their ideas and suggestions about the possibilities of using SQF Chem and the prospects of its implementation. The collected comments were then analysed and verified by the expert team involved in developing the SQF Chem draft. The comments were supplemented by the observations of the experts and the results of discussions that took place during project implementation. The recommendations presented below therefore provide a comprehensive view of the implementation and use of SQF Chem and take into account the perspectives of a diverse range of stakeholders.

All the recommendations presented in this chapter are addressed to potential stakeholders of SQF Chem, including the relevant minister, Sector Skills Council, industry organisations, and users.

The collected recommendations have been divided into areas reflecting different aspects of the implementation and use of SQF Chem.

5.1. Possible ways the sectoral community can use SQF Chem

The Sectoral Qualifications Framework organises the competences in the sector. This makes it a tool that can be used, for example, to identify competence gaps or to indicate competences essential for the implementation of innovative production methods. SQF Chem will make it easier for employers in the sector to define their expectations of future employees, which will allow job positions to be filled more smoothly through both external and internal recruitment. It can also be used to support the process of assessing employees' competences and determining training needs. Additionally, it will help companies in the industry to decide whether to expand or change their business profile or to start new ventures.

Training firms will be provided with a tool allowing them to communicate more effectively with training service customers. A precise description of needs makes it possible to develop a training programme and determine its desired effects, thus increasing the motivation to raise competences both among employers and individuals.

SQF Chem will form the basis of a common language for employers, individuals and companies involved in recruitment processes. HR professionals will gain a tool allowing them to more easily differentiate the competences operating in the sector and to determine whether job applicants have them.

The role of SQF Chem as a document that can serve as a reference point for developing curricula within formal education is also important. The involvement of industry representatives in the process of creating SQF Chem will be an impetus to having formal education better match the needs of the labour market.

5.2. Possible ways SQF Chem can function in the Integrated Qualifications System

Regardless of the possibilities described above, SQF Chem, once included in the IQS, can be used in a wider context. Article 2 of the Act on the Integrated Qualification System indicates that the SQF is *a description of the levels of qualifications functioning in a given sector or industry; the levels of a Sectoral Qualifications Framework correspond to the appropriate levels of the Polish Qualifications Framework*. The qualification level descriptors of sectoral frameworks further elaborate the second stage Polish Qualifications Framework level descriptors typical for vocational qualifications, and take into account the specificity of a given industry or sector. In accordance with the above mentioned act, only a sectoral qualifications framework that has been referenced to the relevant PQF descriptors may be included in the IQS.

At the request of an interested entity or at the initiative of the relevant minister, a developed SQF may be included in the Integrated Qualifications System after meeting certain requirements, such as, among others, demonstrated agreement of the SQF with the PQF. After processing the request, the minister-coordinator of the IQS (the Minister of National Education) issues the appropriate regulation on its inclusion.

Regardless of whether SQF Chem is included or not in the Integrated Qualifications System, it can be used to:

- assign PQF levels to market qualifications included in the IQS – referencing the learning outcomes to the PQF through the SQF descriptors and assigning an appropriate level to them is simpler because the SQF descriptors take into account the specificity of the sector;
- describe market qualifications – it allows sets of competences to be created that can be the basis for developing the required learning outcomes for a qualification;
- design and perform validation.

Certain steps have been taken to use SQF Chem entries as a bridge to facilitate the description of market qualifications in the work on developing the list of competences typical for the chemical industry (a more detailed description of the methodology is provided in section 3.2). In constructing this list, the frequency and prevalence of these competences in the processes and sub-processes identified in the sector were taken into account. The most frequently occurring competences were those required to perform the largest number of identified activities in the sector. Bearing in mind the usefulness of the competence list for the future descriptions of market qualifications, examples of learning outcomes with assessment criteria have been developed for each area (Table 6). They were formulated in accordance with the principles of distinguishing learning outcomes for the purpose of describing market

qualifications. First of all, they were presented as skills and expressed with the use of operational verbs, which is due to the fact that in relation to qualifications, the most important aspect is the implementation of individual professional tasks. For each indicated skill, example assessment criteria were formulated. They more precisely describe the individual skills. The assessment criteria make it possible to plan and perform validation. Efforts were made to formulate the criteria unambiguously, but nonetheless in a general way. They are sample criteria that should be adapted each time the description is being prepared for a specific qualification.

Table 6. Examples of learning outcomes with assessment criteria that should be included in qualifications typical of the chemical industry.

Area	Examples of skills	Examples of assessment criteria	Reference to the SQF Chem level descriptor
Safety	Selects personal protective equipment	a) reads the safety data sheet to determine the required personal protective equipment b) describes the purpose and types of basic and specialised personal protective equipment c) identifies the personal protective equipment required for working with a given substance d) checks the technical condition of personal protective equipment	**SQF Chem Level 3** Knowledge (knows and understands): the basic measures of ensuring safety during the performance of professional tasks Skills (is able to): take measures to reduce the risk of emergencies Social competence (is ready to): comply with the instructions, principles and regulations on safety and the ergonomics of work in the production process
Handling chemicals	Describes the storage conditions for chemical substances	a) describes the legal requirements for the packaging, storage and preservation of chemicals b) indicates the conditions and restrictions associated with the packaging, storage and preservation of a given substance c) discusses the interaction of the given substance with other substances and the conditions for storing the given substance with other substances d) indicates the allowable quantities of substances to be stored at the same time e) specifies the maximum storage time for the given substance	**SQF Chem Level 4** Knowledge (knows and understands): the terms and conditions for packaging, storing, transporting and labelling hazardous and special purpose chemicals the properties of chemicals and basic mixtures of chemicals and their common use in industrial production Skills (is able to): select conditions for the use, packaging, storage and transport of chemicals Social competence (is ready to): comply with the requirements resulting from the properties of chemicals

Area	Examples of skills	Examples of assessment criteria	Reference to the SQF Chem level descriptor
Following procedures	Applies emergency procedures	a) discusses procedures to be followed in the event of a breakdown, fire or release of a substance into the environment b) reads the instructions from the workstation manual on how to address a breakdown, fire or release of the given substance into the environment c) lists the circumstances described in the procedure in which the procedure should be applied d) performs the actions described in the procedure	**SQF Chem Level 3** Knowledge (knows and understands): emergency procedures in the chemical industry Skills (is able to): implement prepared procedures and instructions for emergency response Social competence (is ready to): comply with the instructions, principles and regulations on safety and the ergonomics of work in the production process

5.3. Principles and conditions of using SQF Chem by the sectoral community

To successfully implement SQF Chem, an informational and promotional campaign should be conducted, using the press and other industry media, as well as a dedicated website. Targeted information should also be provided to individual companies, e.g. in the form of consultations.

Representatives of the sector indicated that the entity which should take responsibility for the promotion, implementation and then update of SQF Chem should be the Educational Research Institute, supported by industry experts.

The experience gathered so far, supported by the voice of the sector's representatives, shows that the natural guardian of the SQF is the Sector Skills Council. Its aim is to include employers in the system of identifying and forecasting the need for qualifications and professionals in the labour market and to provide the conditions for the active cooperation of companies from particular branches with schools and educational institutions. The competence area of the chemical industry meets the profile of the Sector Skills Council for the Chemical Sector, which was established in 2019 as part of the project "The Sector Skills Council for the Chemical Sector" (PARP, 2019). Past practices show that the responsibility for SQF Chem, including its future updates, and particularly the application for its inclusion in the Integrated Qualifications System, is a natural area of involvement for the Council.

All representatives of the sector should be involved in the work of the Council, including the Polish Association of Chemical Engineers and the Polish Chamber of the Chemical Industry. This would ensure the representativeness of the work conducted and respond to the needs of the industry's representatives.

5.4. Recommendations for future work with SQF Chem

SQF Chem has been assessed in terms of its flexibility throughout the entire development process, both during the initial design as well as during consultations. The proposed entries were analysed to determine the extent of their universality, so that they encompass all the technologies and organisational solutions in the chemical industry foreseeable at the time of developing SQF Chem. Nevertheless, taking into account the pace of changes taking place and the difficulty in predicting their consequences, it would be well founded to review the SQF Chem within 3–5 years.

The experience of the work conducted shows that in order to ensure the effective course of the process in both creating and developing the SQF, the representativeness of the sector must be ensured. Members of working groups should include persons from enterprises, vocational and higher education institutions, as well as non-formal education. Only those persons who bring value in the form of a thorough knowledge of the industry or experience in developing Sectoral Qualifications Frameworks, including a comprehensive understanding of the IQS Act and the premises of the system, should be included in the expert team and among the other persons involved in further work on the SQF.

BIBLIOGRAPHY

4 trendy, które kształtują przemysł chemiczny (201). Downloaded from https://chemical.pl/wiadomosci/sp/12840-4-trendy-ktore-ksztaltuja-przemysl-chemiczny

Sławiński, S., Chłoń-Domińczak, A., Szymczak, A., Ziewiec-Skokowska, G. (2017). *The Polish Qualifications Framework. User's Guide*. Warszawa: Instytut Badań Edukacyjnych.

Chłoń-Domińczak, A., Sławiński, S., Kraśniewski, A., Chmielecka, E. (2017). *The Polish Qualifications Framework. Knowledge, Skills, Social Competence*. Warszawa: Instytut Badań Edukacyjnych.

Departament Informacji Gospodarczej (2013). *Sektor chemiczny w Polsce*. Gdańsk: Polska Agencja Informacji i Inwestycji Zagranicznych S.A.

Główny Urząd Statystyczny (2016). *Rocznik statystyczny przemysłu*. Warszawa: Główny Urząd Statystyczny.

Państwowa Agencja Rozwoju Przedsiębiorczości (2019). *Rynek pracy, edukacja, kompetencje. Aktualne trendy i wyniki badań*. Warszawa: Państwowa Agencja Rozwoju Przedsiębiorczości.

Perspektywa uczenia się przez całe życie. Załącznik do uchwały Nr 160/2013 Rady Ministrów z dnia 10 września 2013 r.

Pięć trendów, które ukształtują branżę chemiczną do 2035 r. (2015). Downloaded from https://www.chemiaibiznes.com.pl/aktualnosc/piec-trendow-ktore-ksztaltuja-branze-chemiczna-do-2035-r Polska Izba Przemysłu Chemicznego, EY (2017). *Przemysł Chemiczny w Polsce. Pozycja, wyzwania, perspektywy*. Warszawa: Polska Izba Przemysłu Chemicznego.

Ponad połowa pracodawców ma problem ze znalezieniem pracowników (2018). Downloaded 10.11.2019 from https://www.infor.pl/prawo/bezrobotny/aktualnosci-rynku-pracy/2542300,2,Ponad-polowa-pracodawcow-ma-problem-ze-znalezieniem-pracownikow.html

Rynek Chemii w Polsce (2017). Gazeta Finansowa 8–14 września 2017 r. Downloaded from https://gf24.pl/biznes-raport/item/download/172_3db7f28847585412e08e68332fad9e8d+&cd=2&hl=pl&ct=clnk&gl=pl

Sławiński, S. (2017). *Mała Encyklopedia Zintegrowanego Systemu Kwalifikacji*. Warszawa: Instytut Badań Edukacyjnych.

Sławiński, S. (2017). *Słownik Zintegrowanego Systemu Kwalifikacji*. Warszawa: Instytut Badań Edukacyjnych.

Niedobór talentów. Raport ManpowerGroup (2020). Downloaded from https://www.manpowergroup.pl/wp-content/uploads/2020/02/Rozwiazanie_problemu_niedoboru_talentow_PL-1.pdf

Uchwała nr 8 Rady Ministrów z dnia 14 lutego 2017 r. w sprawie przyjęcia Strategii na rzecz Odpowiedzialnego Rozwoju do roku 2020 (z perspektywą do 2030 r.).

Die Digitale Transformation der Industry. Roland Berger Strategy Consultants, BDI, 2015. Downloaded from https://bdi.eu/media/user_upload/Digitale_Transformation.pdf.

Act of 22 December 2015 on the Integrated Qualification System (Journal of Laws of 2019, item 1287).

Annex
Sectoral Qualifications Framework for the Chemical Industry Level Descriptors

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
KNOWLEDGE	DETERMINANTS/SERIES		KNOWS AND UNDERSTANDS					
	CHEMICALS	properties	Basic properties, trade names, market names and labels of chemicals used in production	The properties of commonly used chemicals in the production process	The properties of chemicals and basic mixtures of chemicals and their common use in industrial production	The properties of chemicals and mixtures of chemicals, control of the mixture selection to obtain a product with expected properties	National and global trends in the production of chemicals with specific properties and the resulting potential for their use in production in the chemical industry	The latest developments in the manufacture and use of chemicals for production in the chemical industry
		handling chemicals	The principles of safety for handling chemicals	The principles and methods of preparing and dosing chemicals in the technological process				
			The terms and conditions for packaging, storing, transporting and labelling chemicals	The terms and conditions for packaging, storing, transporting and labelling hazardous and special purpose chemicals	The principles and methods of preparing and dosing hazardous and special purpose chemicals			
	TECHNOLOGY	terminology/ theory	The basic concepts, quantities and physico-chemical laws used to describe unit operations and processes	The physico-chemical fundamentals and principles of describing unit operations and processes	The physical, chemical and physico-chemical phenomena taking place during unit operations and processes	At an advanced level, the physical, chemical and physico-chemical phenomena occurring during unit operations and processes		
		optimisation			The methods of optimising unit processes and the production line	The methods of optimising and standardising production processes		
		methods and techniques	The basic techniques and methods used in production processes in the chemical industry	Typical technical and technological processes used in production in the chemical industry	The technologies for producing typical chemical products	The technologies for producing innovative chemical products	The technical and technological innovations applied in production in the chemical industry, directions of development in the field of chemical technology	The latest developments in the field of chemical technology and other scientific fields
		unit operations		The types of unit operations and processes performed at a workstation	The basic techniques and methods used in the production processes in one's area of the chemical industry	The types, course and method of implementing unit operations and processes in the chemical industry		
		principles of operating machines, using equipment and tools	The principles of operating and daily maintenance of machines, equipment and apparatus as well as using the tools of the workstation	The working parameters and use of machines, equipment and apparatus of the production process, the principles of selecting machines, equipment and apparatus for typical technological processes, the principles of using tools safely and selecting tools for specific professional tasks relating to product production	The structure, mode of operation, principles of adjusting and maintaining machines, equipment and apparatus used in production processes	The principles of developing control programs for machines, equipment and apparatus used in production processes in the chemical industry	Technical innovations in machines, equipment and apparatus for production in the chemical industry	
					The principles of designing technological apparatus and installations	The methods of designing technological apparatus and installations	The directions of development in the field of process engineering and apparatus	Latest innovations in chemical and process engineering
		documentation	The principles of reading the details of technical, assembly and technological installation drawings	The principles of making detailed technical, assembly and technological installation drawings	The principles and methods of producing project documentation			
			The principles of documenting activities performed in the production process of the chemical industry	The principles of preparing the documentation required in the production process of the chemical industry	The principles of preparing the documentation required for conducting activities in the chemical industry			

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
KNOWLEDGE	DETERMINANTS/SERIES		KNOWS AND UNDERSTANDS					
	LEGAL REGULATIONS	concerning chemicals			Legal regulations on the use, registration, marketing and transport of chemicals	Legal regulations on the use, registration, marketing and transport of hazardous and special purpose chemicals		
		protecting property rights			The basic principles of using R&D results	The basic principles of copyright and industrial property law in the scope of using R&D results	National and international legal regulations on copyright as well as the protection and use of property rights relating to the use and implementation of R&D results	
		safety and evironmental protection	The principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection in the scope of performed professional tasks	Legal regulations and other requirements relating to process safety				
			The procedures and rules for handling waste and by-products resulting from the technological process	Legal regulations as well as standards and requirements relating to the processing, storage and disposal of environmentally hazardous chemicals				
	QUALITY	quality management systems		The principles and standards set forth in the integrated quality management systems of the chemical industry	The integrated quality management systems of the chemical industry	The principles of implementing integrated quality management systems in the chemical industry		
		attestations	The types of certificates confirming the quality of chemical products	The conditions and rules for granting certificates attesting the quality of chemical products				
		requirements, standards		The quality requirements for raw materials and mediums intended for production	The standards and indicators for the quality assessment of raw materials, semi-finished products, products and auxiliary materials	The methods for setting standards and indicators for the quality assessment of raw materials, semi-finished products, products and auxiliary materials		
			The requirements for production process parameters	The standards and indicators for assessing production process parameters	The methods of determining the standards and indicators for assessing production process parameters			
		methods		The rules for sampling, labelling, safeguarding and storing the samples taken; the rules of implementing analyses and the stages of analytical procedures	The analytical methods and techniques used in testing raw materials, semi-finished products, chemical products and technological mediums			
			The principles of measuring process parameters	The methods and techniques of testing production process parameters				

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
KNOWLEDGE	DETERMINANTS/SERIES		KNOWS AND UNDERSTANDS					
	DESIGN AND DEVELOPMENT OF A CHEMICAL PRODUCT	product design methods		Typical and other frequently used principles and methods of conducting and controlling laboratory-scale processes and unit operations	A broad range of the methods of conducting and controlling laboratory-scale processes and unit operations			
		methods of conducting experiments			The principles and methods of planning and conducting experiments	The principles of factorial analysis		
		scaling up		The rules of increasing (transferring) the scale of implementing unit operations	The method of calculating mass and heat flow in apparatus; the principles of mass and energy balancing in unit operations and processes	The method of calculating mass and heat flow in apparatus; the principles of mass and energy balancing in technological processes		
		customers		The requirements of chemical product customers	Current trends in the requirements of chemical product customers	The factors shaping the requirements of chemical product customers	The mechanisms shaping the trends relating to the requirements of chemical product customers in domestic and global markets	
		chemical products market			The current selection of products (of a given type/kind) in domestic/global markets	The current domestic/global market demand for a specific product type/kind		
		protection of property rights, patents		The sources of information on patents and research conducted within R&D	The principles of the functioning of the market for licences/patents	The licences and patents available in the market	R&D results available under licences and patents	
	ORGANISING THE PRODUCTION PROCESS	work organisation – plans, timetables		The factors, including human factors, and situations affecting the possibility of disruptions occurring in the work of installations and equipment	The principles and methods of ensuring production continuity			
			The principles of reading daily work schedules	The principles of making daily work schedules	The principles of planning the production process of a specific chemical product	The principles of planning the production process in a chemical plant		
		production costs		The methods and principles of calculating production costs	The methods and principles of calculating investment costs	The methods of analysing the profitability of production		
				The types of production costs	The types of investment costs	The factors affecting the profitability of production		
		prices		The current prices of raw materials, semi-finished products, chemical products and technological mediums	The price trends of raw materials, semi-finished products, chemical products and technological mediums	The factors shaping the prices of raw materials, semi-finished products, chemical products and technological mediums	The mechanisms shaping price trends in the domestic and global markets of raw materials, semi-finished products, chemical products and technological mediums	
		suppliers of raw materials, semi-finished products and mediums	The sources of obtaining raw materials, semi-finished products and technological mediums	The principles of the market organisation of raw materials, semi-finished products and technological mediums	The factors influencing the availability of raw materials, semi-finished products and technological mediums	The domestic market mechanisms of raw materials, semi-finished products and technological mediums	The global market mechanisms of raw materials, semi-finished products and technology mediums	
		outlet markets			The domestic and global conditions affecting the product market (customer groups, export opportunities, competition, prices)	The development trends in the sectors utilising chemical products	The factors influencing the development of industries utilising chemical products	
		documentation	The principles of reading the details of technical, assembly and technological installation drawings	The principles of making detailed technical, assembly and technological installation drawings	The principles and methods of developing project documentation			
			The principles of documenting activities performed in the production process of the chemical industry	The principles of preparing the documentation required in the production process of the chemical industry	The principles of preparing the documentation required for conducting activities in the chemical industry			

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
KNOWLEDGE	DETERMINANTS/SERIES		KNOWS AND UNDERSTANDS					
	ENVIRONMENTAL PROTECTION AND SAFETY	threats	The hazards associated with performing professional tasks	The hazards associated with implementing the technological process	The factors and situations influencing the possibility of hazards occurring in the technological process			
		preventive measures	The basic measures of ensuring safety during the performance of professional tasks	The protection of machines and equipment in the event of breakdowns or disruptions in their work	The complex safety systems of machines and equipment			
			The principles and procedures of applying basic safety measures during the performance of professional tasks and emergencies occurring in the chemical industry	The principles of selecting measures limiting the risk of emergency situations	The principles of designing measures to reduce the risk of emergencies	The principles of designing process safety systems in the chemical industry		
		methods			The principles and methods of the disposal of environmentally hazardous chemicals	The principles of designing production processes in accordance with the premises of a circular economy	Technological innovations in the processing, safeguarding and disposal of wastes and by-products	The latest innovations in the processing, safeguarding and disposal of wastes and by-products
		impact	The types and properties of waste and by-products resulting from the technological process	The types of chemicals that negatively impact the environment	The environmental hazards resulting from the chemicals used in production	The environmental impact of chemicals used in the production process		
	LABORATORY WORK	methods and techniques	The typical techniques and methods used in the production processes of the chemical industry	The typical and other frequently used techniques and methods in the production processes of the chemical industry				
							The directions of development in the field of chemical technology	The latest developments in the field of chemical technology and other scientific fields
		principles of operating machines, using equipment and tools	The principles of operating and the day-to-day maintenance of machines, equipment and apparatus and using the tools of the workstation	The working parameters and application of the machines, equipment and apparatus used in the laboratory; the principles of selecting machines, equipment and apparatus for typical tasks; the principles of safely using tools and selecting them for specific professional tasks	The construction, mode of operation and principles of regulating and maintaining the machines, equipment and apparatus used in the laboratory	The principles of developing control programs for the machines, equipment and apparatus used in the laboratory	The technical innovations of the machines, equipment and apparatus used in the laboratory	
		quality management systems		The principles and standards of integrated quality management systems in the chemical industry, the principles of accrediting laboratories	The integrated quality management systems in the chemical industry	The principles of implementing integrated quality management systems in the chemical industry		
		requirements, quality standards		The quality requirements for raw materials and production mediums	The standards and indicators for the quality assessment of raw materials, semi-finished products, products and auxiliary materials	The methods for setting standards and indicators for the quality assessment of raw materials, semi-finished products, products and auxiliary materials		
			The requirements for production process parameters	The standards and indicators for assessing production process parameters	The methods of determining standards and indicators for assessing production process parameters			
		research methods		The principles of sampling, labelling, safeguarding and storing the samples taken; the principles of implementation and the stages of analytical procedures	Basic analytical methods and techniques used for testing raw materials, semi-finished products, chemical products and technological mediums	The analytical methods and techniques used in testing raw materials, semi-finished products, chemical products and technological mediums	The latest analytical methods and techniques used in testing raw materials, semi-finished products, chemical products and technological mediums	

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
KNOWLEDGE	DETERMINANTS/SERIES		KNOWS AND UNDERSTANDS					
	LABORATORY WORK		The basic principles of measuring process parameters	The methods and techniques for testing production process parameters				
		product design methods		Typical and other frequently used principles and methods of conducting and controlling laboratory-scale processes and unit operations	A wide range of methods of conducting and controlling laboratory-scale processes and unit operations			
		methods of conducting experiments			The principles and methods of planning and conducting experiments	The principles of factorial analysis		
		scaling up		The principles of increasing (transferring) the scale of implementing unit operations	The methods of calculating mass and heat flow in apparatus; the principles of mass and energy balancing in unit operations and processes	The methods of calculating mass and heat flow in apparatus; the principles of mass and energy balancing in technological processes		
		documentation	The basic principles of documenting conducted laboratory activities	The principles of preparing the documentation required in laboratory work				
		safety	The risks relating to the performance of professional tasks	The risks associated with laboratory work	The factors and situations affecting the possibility of hazards emerging in laboratory work			
			Basic measures to ensure safety during the performance of professional tasks	The protection of machines, equipment and apparatus in the event of breakdowns or disruptions in operation				
			The principles of applying basic safety measures during the performance of professional tasks	The principles of selecting measures limiting the risk of emergency situations				
			Emergency procedures in the chemical industry					
		handling waste and by-products	The principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection in the scope of performed professional tasks	Legal regulations and other requirements for work safety in the laboratory				
			The basic procedures and principles of handling laboratory waste and by-products	Legal regulations as well as standards and requirements relating to the processing, storage and disposal of environmentally hazardous chemicals	The principles and methods of the disposal of environmentally hazardous chemicals			
			Basic types and properties of waste and by-products resulting from the technological process	The types of chemicals that negatively impact the environment	The environmental threats arising from the chemicals used in production	The environmental impact of chemicals used in the laboratory		

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SKILLS	DETERMINANTS/SERIES		IS ABLE TO					
	CHEMICALS	properties	Label chemicals in accordance with standards and procedures, identify chemicals based on labelling, trade names and basic properties	Determine the properties of chemicals based on the results of measurements and analyses	Classify chemicals in accordance with standards and procedures			
		handling chemicals	Perform activities relating to securing, packaging, storing and transporting chemicals	Perform activities relating to the preparation of chemicals for the production process	Select conditions for the use, packaging, storage and transport of chemicals	Develop procedures for handling chemicals, including hazardous chemicals		
		application		Determine the conditions for using chemicals	Determine the routine and predictable use of chemicals	Anticipate non-routine behaviours of customers relating to the use of chemicals		
		introduction to the market		Complete the documentation required for placing chemicals on the market	Develop safety data sheets for hazardous substances and mixtures of complex composition on the basis of the safety data sheets for individual substances and mixtures	Prepare safety data sheets for individual hazardous substances and mixtures based on the results of research and literature sources		
	TECHNOLOGY	production technology ("typical character" of the product)			Select and modify the parameters of technological processes to produce typical chemical products	Select and modify the parameters of technological processes to make widely used chemical products	Select and modify the parameters of technological processes to make various chemical products	Develop the technologies for the production of innovative chemical products
		designing production technology		Select unit operations and processes	Design nodes and technological systems	Design complex process systems	Design complex process systems based on innovative technological solutions	Develop and implement innovative production technologies in the chemical industry
		optimisation		Determine the material and energy requirements of the installation	Develop a material and energy balance	Optimise unit operations and processes and optimise technological installations		
		using information and R&D results	Search for general information on available R&D results needed for designing or modifying a chemical product and search the basic specialist literature	Assess the reliability of R&D results and information from various sources, follow the latest developments in available R&D results needed for designing or modifying a chemical product	Search for complex information, selected by area of professional activity, on available R&D results needed for designing or modifying a chemical product and search the professional literature	Assess the quality and analyse the usefulness of R&D results for designing or modifying a chemical product	Develop the premises for implementing R&D results in products being designed or modified	Implement R&D results in new or modified chemical products
		selecting machines and tools		Identify the tools and equipment needed to perform tasks in the production process, equip workstations with the required tools and equipment	Select machines, equipment and apparatus for the production of typical chemical products	Select machines, equipment and apparatus for the production of innovative chemical products or for using innovative raw materials	Design apparatus and technological installations for the production of typical chemical products	Design apparatus and technological installations for the production of innovative chemical products or for using innovative raw materials
		operating machines, using tools and equipment	Perform activities relating to the operation of individual machines and apparatus used in the production process (preparation for work, start-up, adjustment, setting parameters in accordance with instructions, monitoring parameters, shutdown, maintenance and protection after finishing work, recognising operating anomalies); use the tools and equipment needed to perform professional tasks	Perform moderately complex activities relating to the operation of assemblies of machines and apparatus used in the technological process (preparation for work, start-up, adjustment, setting parameters in accordance with instructions, monitoring parameters, shutdown, maintenance and protection after finishing work, recognising operating anomalies); use specialist software for designing, modelling and simulating processes	Perform complex activities relating to the supervision of the operation of assemblies of machines and apparatus used in the technological process (monitoring parameters, recognising operating anomalies, regulating parameters depending on the course of unit operations and processes, taking remedial action in emergency situations)			

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SKILLS	DETERMINANTS/SERIES		IS ABLE TO					
	TECHNOLOGY		Perform activities relating to the operation of basic measurement and laboratory equipment and instruments	Perform moderately complex operations with complex measurement and laboratory equipment and instruments				
		performing tasks	Perform activities relating to the preparation of raw materials, semi-finished products and mediums for production; inter-station transport and storing raw materials, semi-finished and chemical products (e.g. preparing solutions, dosing raw materials and semi-finished products, packaging products)	Perform moderately complex tasks in the production process that require supervising the correctness of individual technological operations and adjusting the parameters depending on the course of the technological operations	Perform tasks in the production process that require supervising the correctness of the technological process and adjusting the parameters depending on the course of the technological process			
		documentation	Read safety data sheets and other documentation as well as the information needed to perform a professional task from workstation instructions; maintain basic documentation of the activities performed in the technological process	Use technical and technological documentation needed to perform and supervise tasks in the technological process, prepare abridged technological documentation and workstation instructions, maintain documentation of the technological process	Develop technical, technological and reporting documentation	Develop procedures, regulations and company standards on the implementation of the production process		
		communication, foreign languages		Use the basic terms of the chemical industry	Use the basic literature of the industry	Use the literature of the industry and communicate at an advanced intermediate level	Use advanced professional literature applying specialist vocabulary, communicate at a level above advanced intermediate	Edit texts and publications in a foreign language, communicate at an advanced level in the international industrial community
		making decisions, division of tasks	Act partially autonomously and interact with others in following required procedures when performing production process tasks or designing a chemical product	Act autonomously and interact with others in following required procedures when performing production process tasks or designing a chemical product	Lead a team implementing specific procedures in the manufacture or design of a chemical product	Make decisions under time pressure and in difficult situations connected with the occurrence of failures in the plant threatening the safety of people, property and the environment	Make decisions in high-risk situations involving imminent danger to human life, health or the environment	
	QUALITY	the course of the process	Assess the correctness of the course of one's activities in the technological process on the basis of required procedures	Monitor the course of unit operations and processes, assess the correctness of the course of supervised unit operations and processes	Control the correctness of implementing the technological process	Define the procedures for supervising the production process	Develop and implement procedures to ensure the correctness of technological processes	
		anomolies in the course of the process	Assess the correct operation of machines, equipment and apparatus	Identify anomolies in the course of the technological process and their causes and eliminate simple causes of anomolies	Analyze the causes of faulty production affecting the quality of chemical products, eliminate the complex causes of errors in the production of chemical products	Diagnose the causes of faulty production affecting the quality of chemical products, identify ways to prevent the occurrence of errors in the production of chemical products, formulate recommendations for the improvement of production quality		
		process measurements	Perform measurements of process parameters	Define the premises for measuring process parameters	Assess the parameters of the technological process on the basis of measurements as well as standards and assessment indicators			
		analytics	Collect, label, safeguard and prepare samples of raw materials, semi-finished products, chemical products and technological mediums for testing	Perform analytical tests in accordance with specified instructions and procedures	Assess the quality of raw materials, semi-finished products, chemical products and technological mediums on the basis of laboratory test results as well as standards and assessment indicators			

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SKILLS	DETERMINANTS/SERIES		IS ABLE TO					
	QUALITY	control plan	Perform control activities in accordance with specified principles and instructions	Supervise the application of principles and control instructions in the production process	Develop a plan for the control of raw materials, semi-finished products, chemical products, technological mediums and the technological process	Define the methods and techniques of the control of raw materials, semi-finished products, chemical products, technological mediums and the technological process		
		control methods			Select methods for process and analytical measurements	Adapt process and analytical measurement methods	Modify the methods of analysing and assessing the properties of raw materials, semi-finished products, chemical products and technological mediums	Design new methods of analysing and assessing the properties of raw materials, semi-finished products, chemical products and technological mediums
		standards and norms		Use norms, standards and instructions on the quality of raw materials, semi-finished products, chemical products and technological mediums as well as those defining the parameters of the technological process	Develop instructions for the application of technical and legal standards on the quality of raw materials, semi-finished products, products and technological mediums as well as the parameters of the technological process	Develop standards defining the parameters of the technological process and the quality requirements for raw materials, semi-finished products, products and technological mediums		
	DESIGN AND DEVELOPMENT OF A CHEMICAL PRODUCT	product modification		Introduce typical, commonly used substitutes for raw materials in chemical product formulas	Introduce new (not yet used) substitutes of raw materials in chemical product formulas	Modify formulas to change the properties of chemical products or optimise production costs		
		product development				Prepare formulas for typical chemical products using routine commonly used production technologies	Develop new, non-routine or not marketed chemical products using typical, commonly used production technologies	Develop new, non-routine or not marketed chemical products using innovative production technologies
		using information and R&D results	Search for general information on available R&D results needed for designing or modifying a chemical product and search the basic specialist literature	Assess the reliability of R&D results and information from various sources, follow the latest developments in available R&D results needed for designing or modifying a chemical product	Search for complex information, selected by area of professional activity, on available R&D results needed for designing or modifying a chemical product and search the professional literature	Assess the quality and analyse the usefulness of R&D results for designing or modifying a chemical product	Develop the premises to implement R&D results for designing or modifying products	Implement R&D results in new or modified chemical products
		conducting experiments		On the basis of instructions, perform tests and studies as part of experiments to develop or modify a chemical product	Perform and control laboratory-scale unit operations and processes and test laboratory-scale chemical reactions based on instructions and plans of experiments	Create and modify the premises to conduct experiments for developing or modifying a chemical product	Develop plans for experiments aimed at creating or modifying a chemical product	Analyse and assess the results of conducted experiments, taking into account the development trends in the chemical industry
		relations in the industrial community		Cooperate with other project and research teams in exchanging experiences and research results	Cooperate with institutes and research centres in exchanging experiences and research results	Establish and maintain relations with institutes and research centres to exchange experiences and research results	Initiate joint scientific and implementation projects with research institutes and centres	
		analysing customer requirements	Search for information on current and projected trends about the requirements of chemical customers	Assess the reliability and quality of information on current and projected trends about the requirements of chemical customers	Define the requirements of chemical product customers based on industry sources (studies, reports, articles)	Identify trends in the requirements of chemical product customers based on market research results	Analyse trend-setting factors in the requirements of chemical product customers; forecast trends relating to the requirements of chemical product customers	Analyse complex economic, sociological and cultural factors shaping trends in the requirements of chemical product customers
					Define the premises for conducting marketing research	Identify niches in the chemical products market, analyse demand and supply in the chemical products market	Analyse the factors shaping supply and demand in the chemical products market	

SQF Chem		LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SKILLS	DETERMINANTS/SERIES	IS ABLE TO					
ORGANISING THE PRODUCTION PROCESS	work organisation – plans, timetables		Develop daily work schedules, procedures for the execution of activities and tasks in the production process	Develop a plan for the production process of a specific chemical product	Develop production plans for the production plant		
	required production resources		Determine the size of the production batch	Identify the resources needed to conduct the production process			
			Calculate the consumption of raw materials for the production of a specific production batch	Define standards for the consumption of raw materials and technological mediums in production			
	production costs		Calculate the cost of raw materials, semi-finished products and process mediums necessary to produce a specific production batch	Develop cost estimates for the manufacture of chemical products	Analyse the profitability of the production process, taking into account production costs and sales forecasts	Develop and implement solutions for optimising production costs	
	prices		Use available sources of information concerning the prices of chemical products and raw materials, semi-finished products, technological mediums and the remaining production factors influencing production costs	Determine the prices or price ranges of chemical products and raw materials, semi-finished products, technological mediums and the remaining production elements influencing production costs	Analyse the conditions influencing the prices of chemical products and raw materials, semi-finished products, technological mediums and the remaining production factors influencing production costs	Forecast the prices of chemical products and raw materials, semi-finished products, technological mediums and the remaining production factors influencing production costs	
	technological potential			Analyse the technological potential of one's production plant to determine the possibility of producing specific chemical products	Analyse the technologies available in the market in terms of the possibility of implementing the production of specific chemical products	Determine the potential for implementing R&D in the production of innovative chemical products	
	suppliers of raw materials, semi-finished products and mediums	Search for basic information about suppliers of raw materials, semi-finished products and technological mediums as well as chemical product customers	Compare information on suppliers of raw materials, semi-finished products and technological mediums as well as chemical product customers within the context of specific criteria (e.g. price, quality)	Analyse the availability of raw materials, semi-finished products and technological mediums required for the production of specific chemical products			
	working with suppliers and customers			Negotiate short and long-term terms of supply, determine the conditions of cooperation with suppliers of raw materials, semi-finished products and technological mediums as well as with chemical product customers	Establish and maintain relations with suppliers of raw materials, semi-finished products and technological mediums as well as with chemical product customers		
	using information and R&D results	Search for general information on available R&D results required for designing or modifying a chemical product and search the basic specialist literature	Assess the reliability of R&D results and information from various sources, follow the latest developments on available R&D results required for designing or modifying a chemical product	Search for complex information, selected by area of professional activity, on available R&D results required for designing or modifying a chemical product and search the professional literature	Assess the quality and analyse the usefulness of R&D results for designing or modifying a chemical product	Develop the premises for the implementation of R&D results	Implement R&D results
	learning, training others	Supplement one's knowledge and skills relating to the tasks performed at work	Systematically update one's knowledge and skills relating to the development of production technology	Improve one's own professional competences; motivate and inspire others to undertake professional development	Identify the level of one's own professional knowledge and skills and those of subordinates, organise one's lifelong learning	Systematically familiarise oneself with the literature of the industry, follow technological innovations, initiate industry events for exchanging knowledge and experiences, organise the process of lifelong learning for others	Systematically read trade, popular science and scientific journals, initiate and actively participate in trade events for exchanging knowledge and experiences
			Provide instructions on occupational safety, environmental protection and handling chemicals	Introduce the work on the technological process to new employees	Conduct training and assess competences relating to the operation and supervision of work with machines, apparatus and technological installations	Develop training materials and programmes and confirm competences relating to the operation and supervision of work with machines, apparatus and technological installations	

SQF Chem		LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SKILLS	DETERMINANTS/SERIES	IS ABLE TO					
ENVIRONMENTAL PROTECTION AND SAFETY	work organisation	Organise one's own workstation and work in compliance with the principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection	Organise moderately complex team work, taking into account the principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection	Plan the complex work of teams, observing the principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection	Plan the organisation of the production process in compliance with the principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection	Implement organisational solutions to improve work conditions and quality	Design organisational solutions to improve work efficiency and quality
	waste management in production	Safeguard waste and by-products in accordance with procedures	Safeguard particularly hazardous waste and by-products in accordance with procedures	Develop company principles and procedures for handling waste and by-products	Develop company principles and procedures for handling especially hazardous waste and by-products		
		Follow company instructions for handling production waste and waste water in the context of one's professional activities	Supervise compliance with the principles and procedures for the handling of waste and by-products by subordinate employees	Control compliance with the principles and procedures for handling waste and by-products in the production plant			
	waste recycling	Classify waste by its recyclability	Assess the suitability of waste and by-products for recycling	Select waste and by-product treatment methods	Design production processes in accordance with the principles of a circular economy	Implement new waste and by-product processing technologies in the production plant	Develop innovative waste and by-product treatment methods
	waste treatment		Identify the hazardous substances in waste and by-products on the basis of performed laboratory tests	Determine waste and by-product treatment methods	Supervise the disposal of waste and by-products in accordance with standards and regulations	Implement new technologies and methods of waste and by-product disposal in the production plant	Develop innovative methods of waste and by-product disposal
	environment		Plan the use of natural resources in accordance with the principles of environmental protection and sustainable development	Select production technologies, operating parameters of the installation, and substitutes of raw materials in a way that minimises the negative impact on the environment	Assess the impact of the production process on the environment	Implement technologies minimising the negative impact of production processes on the environment	Design new technological solutions minimising the negative impact of production processes on the environment
	process safety – risk analysis	Identify anomalies in the technological process that threaten the safety of the process	Identify possible hazards in the production process	Assess the risk of emergency situations occurring in the production process	Assess the degree of risk and implement emergency response measures not covered by compliance procedures		
	process safety – preventive measures	Take measures to reduce the risk of emergencies	Monitor the safety systems of machines and equipment	Select measures to reduce the risk of emergencies in the production process	Develop measures to reduce the risk of emergencies	Implement technologies that improve the safety of the production process	Design new technological solutions to improve the safety of the production process
	process safety – procedures	Implement prepared procedures and instructions in emergency situations	Develop procedures for the operation and emergency shutdown of installations in the event of partial or total reduction in mediums availability	Develop emergency procedures and plans in the event of a threat to people, property or the environment			
LABORATORY WORK	optimisation		Determine the material and energy requirements of the installation	Develop a material and energy balance	Optimise unit operations and processes as well as technological installations		
	selecting machines and tools		Identify the tools and equipment required to perform tasks, equip workstations with required tools and equipment	Select machines, equipment and apparatus for laboratory work			
	operating machines, using tools and equipment	Perform activities relating to the operation of basic measurement and laboratory equipment and devices, use the tools and devices needed to perform professional tasks	Perform moderately complex operations on complex measurement and laboratory equipment and instruments	Perform complex activities relating to the operation of complex measurement and laboratory equipment and apparatus			

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SKILLS	DETERMINANTS/SERIES		IS ABLE TO					
	LABORATORY WORK	performing tasks	Perform activities relating to the preparation of raw materials, semi-finished products and mediums for laboratory work, inter-station transport and storage of raw materials, semi-finished products and chemical products (e.g. preparation of solutions, dosing of raw materials)	Perform moderately complex tasks in laboratory work requiring the monitoring of the correctness of individual operations and the adjustment of parameters depending on the course of the operations, using specialised software for designing, modelling and simulating processes	Perform tasks in the laboratory requiring the supervision of the correctness of laboratory tests and the regulation of parameters depending on the course of the test			
		making decisions, division of tasks	Act partially autonomously and interact with others in following required procedures when performing laboratory tasks	Act autonomously and interact with others in following required procedures when performing laboratory tasks	Lead a team performing specific procedures in the laboratory	Make decisions under time pressure and in difficult situations when installations fail and threaten the safety of people, property and the environment	Make decisions in high-risk situations involving imminent danger to human life, health or the environment	
		assessing the course of the process	Assess the correctness of the course of one's activities	Monitor the course of unit operations and processes, assess the correctness of the course of supervised unit operations and processes	Control the correctness of laboratory work	Define procedures for the supervision of the course of laboratory work	Develop and implement procedures to ensure the correct course of laboratory work	
		anomalies in the course of the process	Assess the correct operation of machines, equipment and apparatus	Identify anomalies in the course of laboratory work and their causes as well as eliminate simple causes of anomalies	Analyse the causes of faulty production affecting the quality of chemical products, eliminate complex causes of errors in the production of chemical products	Diagnose the causes of faulty production affecting the quality of chemical products, identify ways to prevent the occurrence of errors in the production of chemical products, formulate recommendations for the improvement of production quality		
		process measurements	Perform measurements of process parameters	Define the premises for the measurements of process parameters	Assess the parameters of the technological process on the basis of measurement results as well as standards and assessment indicators			
		analytics	Collect, label, safeguard and prepare samples of raw materials, semi-finished products, chemical products and technological mediums for research	Perform analytical tests in accordance with specified instructions and procedures	Assess the quality of raw materials, semi-finished products, chemical products and technological mediums on the basis of laboratory test results as well as standards and assessment indicators			
		control plan	Perform control activities in accordance with specified rules and instructions	Supervise the application of rules and control instructions in the production process	Develop a plan for the control of raw materials, semi-finished products, chemical products, technological mediums as well as the technological process	Define the methods and techniques to control raw materials, semi-finished products, chemical products, technological mediums as well as the technological process		
		control methods			Select methods for process and analytical measurements	Adapt process and analytical measurement methods	Modify methods of analysing and assessing the properties of raw materials, semi-finished products, chemical products and technological mediums	Design new methods of analysing and assessing the properties of raw materials, semi-finished products, chemical products and technological mediums
		product modification		Introduce typical, commonly used substitutes for raw materials in chemical product formulas	Introduce new (not yet used) substitutes of raw materials in chemical product formulas	Modify formulas to change chemical product properties or optimise production costs		
		product development				Prepare formulas for typical chemical products using typical, commonly used production technologies	Develop new, non-routine or not marketed chemical products using typical, commonly used production technologies	Develop new, non-routine or not marketed chemical products using innovative production technologies

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SKILLS	DETERMINANTS/SERIES		IS ABLE TO					
	LABORATORY WORK	conducting experiments		Follow instructions to perform tests and studies as part of experiments to develop or modify a chemical product	Conduct and control laboratory-scale unit operations and processes and study laboratory-scale chemical reactions, based on instructions and plans for experiments	Develop and modify the premises for experiments to develop or modify a chemical product	Develop plans for experiments aimed at developing or modifying a chemical product	Analyse and assess the results of the conducted experiments, taking into account the development trends in the chemical industry
		documentation	Read safety data sheets as well as other documentation and information from workstation instructions needed to perform a professional task; maintain basic documentation of the activities performed in the laboratory	Use the technical and technological documentation needed to perform and supervise tasks in the technological process				
		work organisation	Organise one's own workstation and work in compliance with the principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection	Organise moderately complex team work, taking into account the principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection	Plan the complex work of teams, observing the principles and regulations of occupational health and safety, fire prevention, ergonomics and environmental protection			
		managing production waste	Safeguard waste and by-products in accordance with procedures	Safeguard particularly hazardous waste and by-products in accordance with procedures	Develop the principles and procedures for handling waste and by-products	Develop the principles and procedures for handling especially hazardous waste and by-products		
			Follow instructions for handling production waste and waste water in one's professional activities	Supervise compliance by subordinate employees with the principles and procedures for handling waste and by-products	Control compliance with the principles and procedures for handling waste and by-products in the laboratory			
		waste recycling	Classify waste by its recyclability	Assess the suitability of waste and by-products for recycling	Select waste and by-product recycling methods			
		waste treatment		Determine the content of harmful substances in waste and by-products on the basis of performed laboratory tests	Define waste and by-product treatment methods			
		process safety – risk analysis	Identify anomalies in the technological process that threaten the safety of the process	Identify possible hazards in the laboratory	Assess the risk of emergencies occurring in the laboratory	Assess the degree of risk and implement emergency response measures not covered by required procedures		
		process safety – preventive measures	Take measures to reduce the risk of emergencies	Monitor the safety systems of machines and equipment	Select measures to reduce the risk of laboratory emergencies			
		process safety – procedures	Implement prepared procedures and instructions for emergency response					

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
	DETERMINANTS/SERIES		IS READY TO					
SOCIAL COMPETENCE	RELATIONS, COMMUNICATION, COOPERATION	communication	Communicate on matters concerning straightforward professional tasks in the closest professional environment (co-workers, supervisor)	Communicate to enable good cooperation on matters concerning complex professional tasks in the team and with other teams	Communicate with the professional community on complex professional matters using specialist terminology	Communicate in interdisciplinary working groups on specialist topics		
					Communicate with chemical product customers	Communicate with the service environment, including suppliers, research and consulting companies as well as other entities	Communicate with the broad industrial and scientific community, including representatives of the scientific, research and development sector	
		cooperation	Cooperate with others in matters concerning straightforward professional tasks in the closest professional environment (co-workers, supervisor)	Cooperate with others in matters relating to complex professional tasks in the team and with other teams to enable the execution of various tasks in production processes	Cooperate in matters concerning complex professional tasks with various teams within the company; cooperate with customers and cooperants	Cooperate within interdisciplinary teams and the service environment, including suppliers, research and consulting firms as well as other entities	Cooperate in the broad industrial and scientific community on activities to develop product and technological innovations	Initiate and develop cooperation among scientific and business communities, including at the international level, to develop and transfer solutions for innovative products and technologies
		maintaining relations	Maintain essential relations in matters concerning simple professional tasks with the closest professional environment (co-workers, supervisor)	Maintain essential relations on matters concerning complex professional tasks with the team and with other teams to enable good cooperation	Maintain long-term relations in the workplace and chemical industry	Maintain relations with partners and contractors to enable the development of the enterprise	Shape positive relations in the work environment, motivate others to work, establish lasting business relations with suppliers, product customers as well as representatives of the science, research and development sector	Shape positive relations in an interdisciplinary and international working environment
	ATTENTION TO QUALITY	assessing the quality of one's own work and that of the team	Perform professional tasks reliably and accurately, care about the quality of the work being done, and assess the quality and diligence of the performed work	Care about the quality of one's work and that of the team one directs, assess the quality and diligence of the work being performed by oneself and the subordinate team				
		quality impact	Take into account the influence of the quality of one's work on the tasks and results of the work of one's team	Take into account the impact of the quality of one's work and the work of the team one directs on the quality of the final product	Critically assess the effects of one's own work and that of the teams one directs, predict the consequences of one's actions	Implement standards and principles on maintaining the high quality of chemical products	Promote principles on maintaining the high quality of chemical products	Develop standards and principles on maintaining the high quality of chemical products
	ETHICAL STANDARDS AND TECHNOLOGICAL REQUIREMENTS	ethical principles and standards	Act in accordance with the procedures and instructions of the workstation as well as with the regulations and standards describing the manner of implementing technological production processes in the chemical industry	Comply with professional secrecy, regulations on using intellectual property and the principles of honesty, integrity and confidentiality set forth in the ethical and professional standards	Promote ethical and responsible research, chemical product manufacturing and production technology implementation	Promote the principles of ethics and responsibility in conducting research and implemention work, comply with the principles of ethics and intellectual property rights in conducting scientific research and implementation work	Require oneself and others to comply with professional secrecy and the principles of using intellectual property, the culture of cooperation and competition	Develop models of ethical behaviour in relation to intellectual property rights, the culture of cooperation and competition
		requirements concerning chemicals	Comply with the requirements resulting from the properties of chemicals	Comply with the requirements resulting from the properties of hazardous chemicals and implementing technological processes that may pose a threat to people, property and the environment	Promote ethical principles and the responsible handling of chemicals, including hazardous chemicals			
		adapting to change		Adapt to changes in the work environment relating to the development of production technology	Demonstrate openness to changes in the work environment and industry relating to the development of production technology	Initiate changes in the work environment relating to the development of production technology	Initiate changes in the industrial community relating to the development of production technology	Initiate changes in the international industrial community relating to the development of production technology

SQF Chem			LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SOCIAL COMPETENCE	DETERMINANTS/SERIES		IS READY TO					
	RESPONSIBILITY	safety	Comply with instructions, principles and regulations on safety and the ergonomics of work in the production process	Care about the safety and ergonomics of one's own work and that of one's subordinates when performing production tasks	Act on behalf of improving work safety and quality in one's work environment	Act to improve the safety and quality of work in the industrial community	Develop and implement models of good practice, organisational culture and safety in the industrial community when performing the work of production processes	
		environmental protection	Comply with instructions, principles and regulations relating to environmental protection in the production process	Perform professional tasks with respect for natural resources and care for environmental protection	Promote pro-ecological attitudes in the work environment, including the concept of sustainable development and the principles of a circular economy	Promote pro-ecological attitudes in the industrial community, including the concept of sustainable development and the principles of a circular economy	Develop pro-ecological models relating to the implementation of production processes	Initiate and promote actions to protect the environment and minimise the harmful impact of the sector's activities on the environment
		autonomy	Act partially autonomously and interact with others in following required procedures when performing production process tasks or designing a chemical product	Act autonomously and interact with others in following required procedures when performing production process tasks or designing a chemical product				
		taking responsibility (research)				Take responsibility for implementing research	Assess the impact and foresee the long-term consequences of implemented innovations	Make decisions relating to the implementation of research results conducted within R&D
		taking responsibility (production process)	Take responsibility for the correctness, quality and safety of the professional tasks performed	Take responsibility for supervising the technological process, including the quality, results and safety of one's own work and that of subordinate teams, for the products delivered to customers, in particular with regard to the safety of products and their impact on the lives and health of users	Take responsibility for the chemical production process, including the safety of operations and environmental impact	Make decisions under time pressure and in difficult situations connected with the occurrence of installation failures threatening the safety of people, property and the environment	Make decisions in high-risk situations involving imminent danger to human life, health or the environment	

The Sectoral Qualifications Framework for the Chemical Industry is a tool to support chemical sector employers and employees in developing competences. Its aim is to improve human resource processes in companies and to help employees independently determine their career and learning pathways. It can also be a useful tool for education and training institutions.

Information is presented on the design of the Sectoral Qualifications Framework for the Chemical Industry (SQF Chem), such as: the development context, how the work was conducted and the methodology used, the framework structure and instructions for reading it, recommendations for implementing and using SQF Chem in Poland, as well as a glossary of key terms. The annex contains the SQF Chem level descriptors – the set of general descriptions characterising the knowledge, skills and social competence required of qualifications at a given level.

SQF Chem may be used in a number of ways:

- to develop educational programmes for the chemical industry sector, both in formal and non-formal education
- to assess and validate the individual competences actually used in the chemical industry relating to specific work tasks or job positions
- to enable HR departments to clearly define the requirements to be met for specific job positions within a company
- to support self-learning by chemical industry employees at various stages of their professional career

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