Education gives the basics
Working makes you a professional

Mapping of skills in the chemical industry 2018

KEMIAN TEOLLISUUS

Meaningful and interesting work

The chemical industry is a globally growing field that enables sustainable development. We need to attract the most talented people in the future as well!

The chemical industry is one of the most important export sectors

The chemical industry is one of the most important industrial sectors in Finland. It accounts for about 20% of the industrial production and the export of goods.

The chemical industry in Finland includes the oil, gas and petrochemical industries, the basic chemical industry and the manufacturing of chemical products such as pharmaceuticals, paints, cosmetics, detergents and plastics and rubber products.

The chemical industry has strong networks, and its products are needed in almost all other fields of production. Apart from the direct exports of the chemical industry, a significant proportion of the products produced by the chemical industry are exported as part of products produced by other sectors.

The chemical industry is a stable employer

The chemical industry employs around 34,000 directly and almost 100,000 indirectly. At the same time as the Finnish factory industry has lost tens of thousands of jobs, the number of employees in the chemical industry has remained stable.

Employees in the chemical industry are highly educated

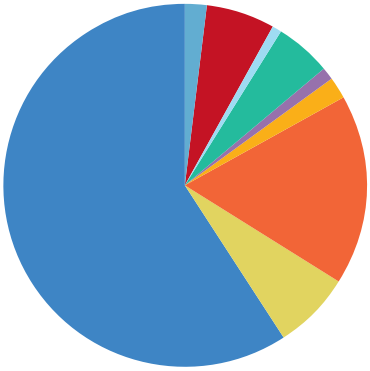
Around 50% of the employees have a vocational education. Those who have degrees from universities and universities of applied sciences each represent around 25% of the workforce.

Around 60% of both managers and other staff have degrees in the field of natural sciences or technology.

All activities in the chemical industry are based on responsibility

The chemical industry is committed to continuous improvement in terms of environmental matters, health and safety. The Responsible Care programme has been implemented in the field for more than a quarter of a century. A comprehensive tracking of indicators has shown that the work has produced results. Competence and highly educated staff are the foundations of responsibility.

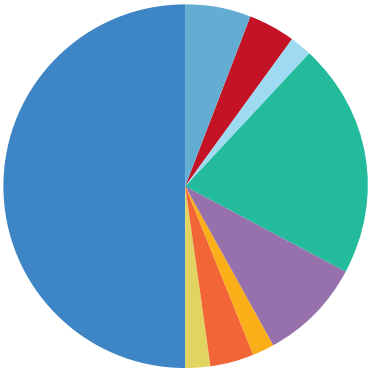
Field of education among employees in the chemical industry



- Engineering, manufacturing and construction 59%
- Social services and health care 2%
- General education 6%
- Humanities and arts 1%
- Business and social sciences 5%
- Natural sciences 1%
- Agriculture and forestry 2%
- Other or unknown field of education 17%
- Services 7%

EK wage statistics IV quarter 2017

Level of education among managers in the chemical industry



- Engineering, manufacturing and construction 50%
- Social services and health care 6%
- General education 4%
- Humanities and arts 2%
- Business and social sciences 21%
- Natural sciences 9%
- Agriculture and forestry 2%
- Other or unknown field of education 4%
- Services 2%

EK wage statistics September 2017

Background of the mapping of skills

The results of this publication are based on a survey conducted in 2018, where Innolink Research Oy interviewed 153 representatives of management in 126 member companies of Kemianteollisuus ry by phone. Additionally, 15 in-depth interviews were conducted, which focused on the quality of the education, recruitment and expectations on the educational system.

More information
www.kemianteollisuus.fi/en

Mapping of skills in the chemical industry 2018

1

The decreasing supply of workers also affects the chemical industry

The educational structure of the recruited personnel remains the same. Challenges related to skills may constitute obstacles for growth.

63% of businesses in the chemical industry predict that their business will grow in the coming years. Only 3% expect their business activities to decrease.

According to interviews conducted as part of the mapping of competence needs, the growth of the business will increase the need for recruitment somewhat or significantly in 34% of companies. 12% of the companies believed that the level of expertise constitutes a very or quite probable obstacle for growth.

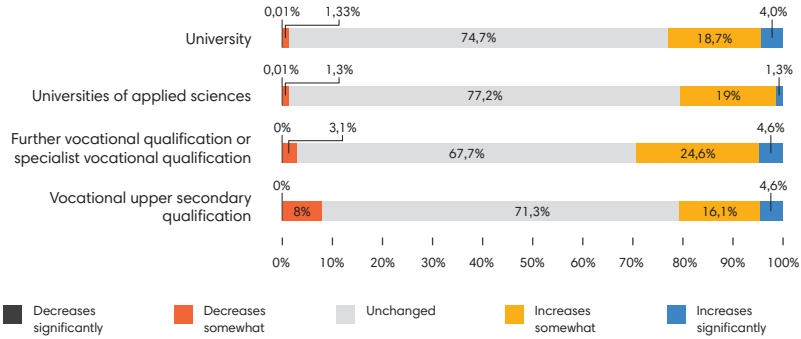
The recruitment needs will mostly continue in line with the current educational structure of the staff. According to the assessments of the companies, the needs for employees with further vocational qualifications and specialist vocational qualifications will increase the most.

The chemical industry experiences competition for professionals

So far, the availability of workers for chemical companies has been mostly good, but the tightening competition for professionals has already reflected in the recruitment of companies as decreasing numbers of applicants and prolonged recruitment times.

The work performed in the chemical industry is strongly linked to other industrial sectors and services, so the labour shortages already experienced in other sectors will certainly be visible in the chemical industry if they continue.

The companies' assessment of changes in recruitment needs per level of education



Source: Innolink Research/Company inetrviews

Examples of tasks and professions where companies have encountered recruitment issues

- electricians and automation mechanics and electrical engineers
- production engineers, particularly in geographical areas where the demand for workers is high in other sectors
- foremen and other management tasks
- top experts in research and development, e.g. in pharmaceutical specialties
- sales tasks that require knowledge in the field
- laboratory technicians (regional differences in availability)
- bioinformatician tasks
- data processing tasks

2

Learning the job by doing it

The role of the educational system is to create a basis for learning through making education more oriented towards working life.

The chemical industry is a diverse field where no two companies are the same. It is clear that working makes you a professional. The companies do not expect the schools to produce experts on the specific production of their business, but the expectations on the educational system are still high.

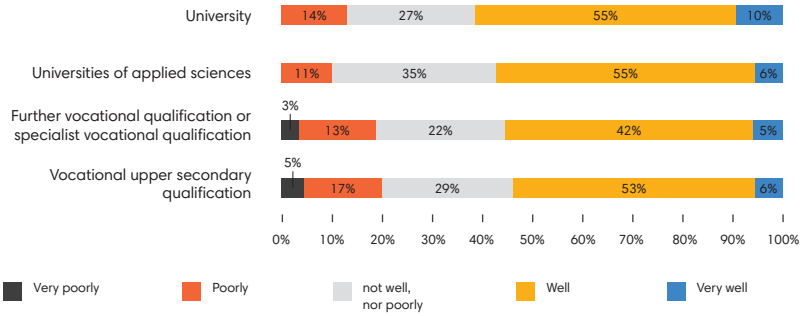
Slightly more than 50% of companies in the chemical industry feel that basic vocational education corresponds to their needs. 57% of companies are happy with the education offered by universities of applied sciences, and 61% feel that the education offered by universities correspond well or very well to their needs.

The increased significance of further vocational qualifications and specialist vocational qualifications indicates the importance of learning in the workplace. It is apparent that degrees completed in working life are an important route to the training of skilled employees.

Many are quite happy with the education, but the goal of the educational system should be to further increase the number of companies that are happy with how the education corresponds to working life.

Suitability of the education for the needs of the chemical industry

How well does the education correspond to the needs of your company?



Source: Innolink Research/Company inetrviews

Expectations of the chemical industry

- The correspondence between education and working life is continuously improved through increased cooperation between educational institutions and companies and through the development of flexible forms of cooperation that anticipated competence needs.
- Learning environment similar to workplaces are built in order to support workplace-based learning in vocational education.
- Flexible, modular, continually evolving training paths are offered at all levels of education.
- The flexibility of apprenticeship training agreements and the possibilities for using them are improved further.

3

A controlled implementation of the reform of the vocational education must be ensured

The responsibility of the companies must not be increased any further. Contact teaching must not be compromised any further.

A basic vocational degree in the field of technology, which is complemented with learning at work for example through an apprenticeship training agreement, provides a good basis for work in production in the chemical industry.

The resource cuts in recent years have been particularly harsh on vocational education. At the same time, an ambitious reform of the vocational education is implemented.

Close cooperation between companies and educational institutions is necessary, but the companies are very concerned about the implementation of the education.

As less contact teaching is offered by the educational institutions, there is a risk that a sufficient knowledge basis is not created and that the students are left to fend for themselves. Marginalisation constitutes a threat.

“ It would be important for educational institutions, companies, students and employees to be able to cooperate seamlessly in the same facilities. There should definitely be more cooperation.”

Manufacturer of plastic products

“ I am very worried about the future of vocational education, as the responsibility for it is transferred to companies. … The companies do not have enough resources for education.”

Manufacturer of plastic packaging

Expectations of the chemical industry

- No more of the responsibility for training and education should be transferred to companies.
- Sufficient contact teaching and guidance must be ensured, so that the education provides a sufficient basis for learning at work. These students must never be left to fend for themselves.
- The availability of educational programmes that are small in volume but important to the chemical industry is ensured. These include basic degree programmes in the process industry and the laboratory sector as well as programmes related to the plastic and rubber industries.

4

Most are happy with the tertiary education

A better balance between ensuring basic know-how and widening of skills is needed.

The chemical industry typically employs people with university degrees in technology or natural sciences, but the industry also needs graduates form other fields, such as commercial and social sciences. As a whole, the companies are quite or very happy with the skills of graduates from universities and universities of applied sciences.

However, the interviews raised concerns about the areas of emphasis in university education in science and technology. The competence skills of working life have expanded and become more diverse, and in recent years, educational institutions have sought solutions to this by making the studies more comprehensive and interdisciplinary. At many universities, the studies start with very general Bachelor's level students, and the areas of specialisation are chosen at the Master's level.

For the companies, there are both positive and negative aspects to this. Comprehensiveness is needed to understand wholes and to create efficient interaction between experts in different fields. Those who know the basics of several fields create connections between the different fields.

However, there are concerns that a strong knowledge of the basics of natural sciences and in-depth understanding do not develop. This threatens both the solving of emerging problems and the emergence of new innovations.

“Universities have provided us with some very skilled workers.”

Company in the equipment and diagnostics field

“There have not been any surprises. University education has suited our needs.”

Manufacturer of chemicals

“An ability to combine theory and practice. It is generally necessary to understand working life regardless of the level of education.”

Company in the field of technochemistry

Expectations of the chemical industry

- In-depth scientific understanding is fostered already in upper secondary school education.
- The importance of in-depth scientific knowledge is highlighted and young people who are interested in natural sciences are encouraged to study these subjects.
- Students of natural sciences and mathematics are given the opportunity to participate in research projects already at an early stage of their studies.

5

Digitalisation is the area where the skills are most lacking

Most are well acquainted with production technology in their own fields.

Production in the chemical industry is already automated to a large extent, but it is clear that digitalisation will change the companies in many ways and on many levels.

According to a survey conducted in 2016[1], more than half of the companies in the chemical industry consider themselves to be pioneers in digitalisation or actively benefit from it. On the other hand, some companies have only recently started examining what digitalisation means for them. Regardless of the company's level of digitalisation, training and knowledgeable staff is needed to promote competitiveness based on digitalisation.

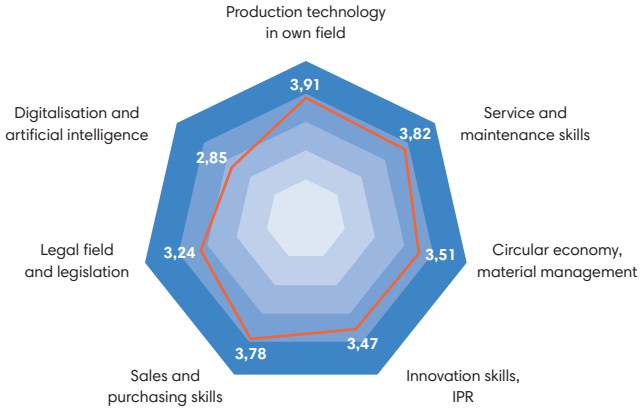
[1] Digitalisation survey in the chemical industry 2016

The companies are aware that digitalisation skills are lacking. The improvement of the use of existing systems is in itself a challenge, but resources also need to be found for the following of the quick technological development, development of skills and anticipation of the future development of the industry. An ability to see what is important for companies in the digital development is needed.

The lack of professionals such as programmers which is seen in other fields will also affect the digitalisation development in the chemical industry. In the future, there will surely be demand for developers of artificial intelligence and machine learning applications who are familiar with the chemical industry.

Companies' assessment of their own level of expertise

Assessment of the company's own level of skill on a scale of 1–5



Source: Innolink Research/Company inetrviews

Expectations of the chemical industry

- The basics of digitalisation are learned already in general education.
- Digitalisation is an integral part of all studies. The digital skills of teachers at all levels of education are strengthened.
- Companies are encouraged to explore the potential of digitalisation and anticipate the needs for digitalisation skills.

6

Not only mathematics, but also natural sciences

Mathematics develop reasoning skills and knowledge of natural sciences create a basis for innovation.

The success of the chemical industry is built on a strong knowledge of natural sciences and technology. The level of knowledge in natural sciences and mathematics has been good in our country in international comparisons, but our position in comparison to other countries has weakened in later years.

A lowered level of knowledge has been observed also in businesses. Half of the companies in the chemical industry find the knowledge of natural sciences and mathematics among recent graduates to be lacking.

Room for improvement has been observed in mathematical and logical thinking and in the knowledge of basic concepts in natural sciences. Understanding the natural and technical causal relationships both in the process and in the planning and management of processes is essential for productive and safe operation.

The development of scientific knowledge requires perseverance. An interest in natural sciences and mathematics must be developed from early childhood, and children and young people at all levels of education should be encouraged to study these subjects.

50% of companies find that there is room for improvement of the skills in natural sciences and mathematics among recent graduates.

“The quality of studies [of natural sciences and mathematics] has not been good. There has been a lot of self-studies, particularly at universities of applied sciences.”
Company in the environmental industry

“I would say that the studies could be more practically oriented. It is difficult for some to apply what they have learned in working life.”
Company in the plastic industry

Expectations of the chemical industry

- Increase the interest in natural sciences and mathematics on all levels of education.
- Mathematics (advanced or basic syllabus) should be made a compulsory subject in the matriculation examination.
- Special measures should be taken to improve the knowledge of natural sciences and mathematics among class teachers.
- Students who achieve good results in natural sciences and mathematics are given the opportunity to progress in their studies at a level that corresponds to their skills.

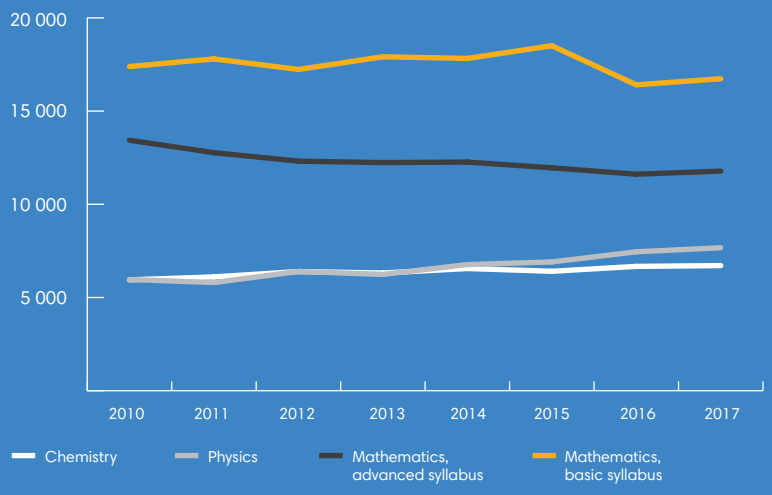
The matriculation examination tests in natural sciences and mathematics are good choices

The numbers of students who take the matriculation examination tests in natural sciences and mathematics have not changed dramatically in recent years, but the continuously decreasing numbers of students who take the advanced syllabus mathematics test raise concerns. The numbers of students taking the tests in physics and chemistry have increased somewhat, which is a welcome development.

Young people should be encouraged to take the matriculation examination tests in natural sciences and mathematics, as this has been shown to improve the chances of being accepted for higher education[2]. Surveys have shown that up to 90% of those who take the tests in advanced syllabus mathematics, physics and chemistry are accepted into university.

[2] The AVAIN research group of the University of Oulu

Students registered for the matriculation examination tests in chemistry, physics and mathematics 2010–2017



Source: The Matriculation Examination Board

7

Safety is part of the professional skills

All educational institutions must create a safety culture that fosters a good attitude towards safety.

The chemical industry is one of the safest industrial sectors. Safety is the basis of all tasks. According to interviews with companies, attitudes to safety constitute an important recruitment criterion.

A correct attitude to safety and safe working practices are skills that cannot be learned separately from the work or in a single course. The companies have noticed that there is room for improvement when it comes to the knowledge about safety among students and recent graduates, and these issues should be addressed already during the studies. When the correct attitude to security is adopted already when a person starts school, it becomes an integral part of the work.

> “The safety thinking should be introduced already at school. There would be an awareness of the features of a safety-critical industry.”
>
> Company in the chemical industry

Expectations of the chemical industry

- The educational institutions develop their safety culture so that students adopt the correct attitudes and the foundations for safe work already during their studies.
- Safety becomes an integral part of the studies at all levels, from vocational schools to universities.

8

Immigrants as a resource

Language skills and the attractiveness of Finland constitute challenges.

Professionals for advanced expert roles in the chemical industry are increasingly recruited also from abroad. The reason for recruiting from abroad is often that skills corresponding to the company's needs are not found in Finland. On the other hand, the reason for recruiting abroad may also be a general need for increasing diversity among the staff and build contacts with foreign universities and other competence centres. The fact that Finland is neither very attractive nor very well-known often constitutes a challenge in the recruitment of specialists.

The lack of professionals that has affected other sectors, such as the lack of programmers, will also affect the chemical industry in the coming years. Therefore, it is important to build good channels and practices for the recruitment of top professionals from abroad. Foreign students who have completed degrees in Finland constitute an important target group.

Another perspective on the recruitment of foreigners is related to immigration that is not work-related. Among the immigrants, there might be people who are interested in the chemical industry or who have previously worked in the industry. A survey conducted among young people has also shown that young immigrants are more interested in the chemical industry than Finnish youth[3].

However, requirements for language skills complicate the recruitment of immigrants for work in production in some companies. In order to work safely, the employees need to understand instructions and be able to communicate in the language of the work community, which is Finnish.

[3] Kun koulu loppuu survey 2017, TAT / T-Media

16% of companies believe that work-related immigration is a very or quite likely solutions to their competence needs.

> “There is a lack of new professionals in Finland. For example, people with expertise in organic chemistry are easier to find abroad.”
> Manufacturer of chemicals

> “In the pharmaceutical industry, language skills are very important because of instructions.”
> Company in the pharmaceutical industry

> “I see no obstacles [to the recruitment of immigrants] in any area. Everyone is in an equal competitive position.”
> Company in the plastic industry

Expectations of the chemical industry

- The awareness and attractiveness of Finland as a place to work are systematically improved, for example through the Talent Boost programme initiated by the ministry of Economic Affairs and Employment.
- The recruitment of top experts from abroad is facilitated.
- People who have come to Finland, such as students and the spouses of foreign professionals, are provided with better opportunities for finding work in Finnish companies. This requires both flexible workplace practices and more opportunities for traineeships in companies.
- The employment rates among immigrants are improved through systematic language teaching and integration.

9

Lifelong learning

In the future, learning will become a more and more integral part of all work. The goal at every stage of the educational system should be to improve the ability to learn.

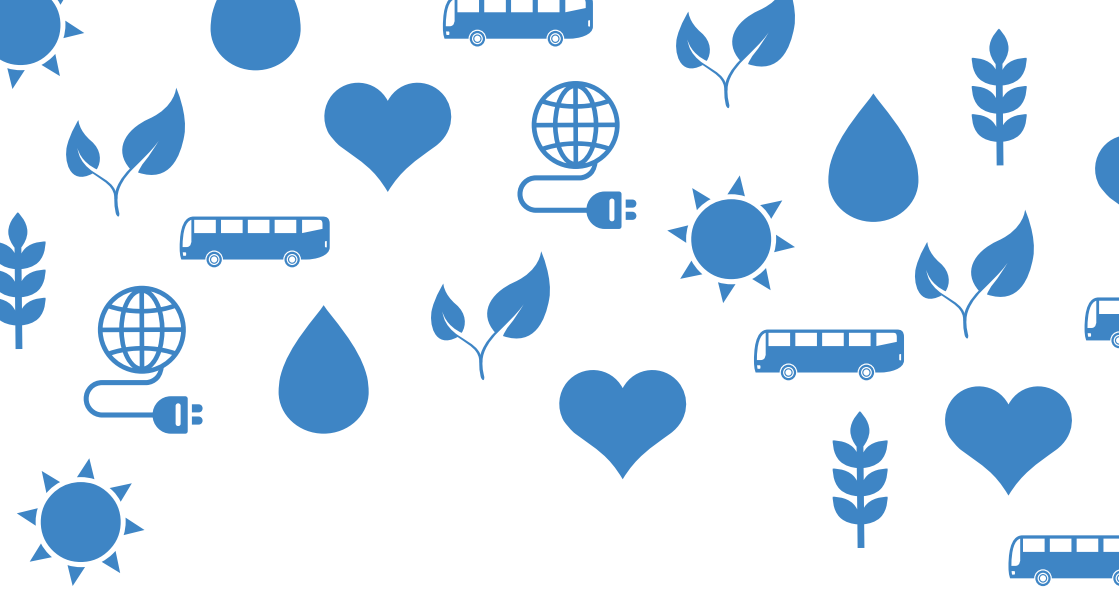
The areas of emphasis vary between different stages and fields of education, but creating and maintaining interest is always essential.

Expectations of the chemical industry

- Opportunities for lifelong learning are created by increasing the provision of modular education in all forms of education.
- Open education at universities and universities of applied sciences is strengthened as a route to learning, which can be used by both companies and individuals for competence development.
- Lifelong learning is the key to success in the global competition. The contribution of companies to lifelong learning should not be increased when the individual's opportunities for further training are developed.

Working life skills that will be important for businesses in the chemical industry in the future

- Self-management and management of one's own work
- Knowledge of the rules and practices of the labour market
- Job seeking skills
- Proactivity and flexibility in cases of change
- An active approach to the work and its development
- Problem solving skills
- Language skills
- Ability to work with different types of people and in different cultures
- Interpersonal skills
- Safety knowledge and attitudes



Kemianteollisuus ry
The Chemical Industry Federation of Finland
Eteläranta 10 PL 4, 00131 Helsinki, Finland
firstname.lastname@kemianteollisuus.fi
kemianteollisuus.fi/en
@kemianteollisuu