



Science: Where Can It Take You?

The Film explains to youngsters aged 14 to 18 the importance of STEM education (science, technology, engineering, mathematics) as a possible entrance portal to join great industries such as the chemical industry, which is a good industry to work for.

STEM education helps to understand what the planet earth is made of, where all living creatures on this planet come from, what life means, what our planet is part of and how we relate to the cosmos. Science is chemistry, physics, biology, medicine, pharmacy and other disciplines coming together. Technology, engineering, economics, even a lot of games we play, all use mathematics. All that is STEM and that is why going for STEM makes a difference. STEM education may in addition create for young people, boys and girls, **better career opportunities**, for example, by working for interesting industries that are at the core of innovative solutions matching the world population's evolving and ever increasing needs.

One of these industries is the **chemical industry, which is the necessary supplier of all other industries in the world.**

- More than 95 % of all products that we use on a daily basis have a chemical industry made component in it.
- Summarizing the history of the last 200 years, the chemical industry has been at the root of all major scientific discoveries over that period.
- Our average life expectancy has increased from 25 to almost 80 years over the past 150 years, thanks, for a major part, to the chemical industry.
- The chemical industry gives the global population access to their needs: drinkable water, food, health and health care, comfortable and attractive clothes, "green" buildings and transport modes consuming less energy and reducing emissions, instant communication (mobile phones, computers and tablets).

Innovate and bring sustainable solutions matching people's needs are what the chemical industry is all about. Therefore this industry needs educated dynamic young people to join its ranks, in a multidisciplinary and team working approach. Today, in certain European countries only two out of ten students go for STEM. However, the need is for at least double that number.

Frequently asked questions:

1. What is a "career" by reference to a "job"?

- 1.1 A *career* is a course of progress of a person's life through learning and work. You may choose to work as an independent entrepreneur producing goods or services for customers. You also may opt for working, for example, for a multinational organization which brings many advantages. These are, in a non-limitative way: more job security, gaining international experience, the opportunity to constantly learn and receive training whilst earning a living, to develop skills further through

the performance of a succession of different jobs whilst being employed by one and the same company and building seniority. One may also may go for one segment (for instance chemicals) but choose to work over time for different companies in order to broaden one's professional experience, if not one's geographical reach.

- 1.2 A **job** is a task to fulfill. One can perform a specific task for a short or a longer period of time. Some people prefer to do the same job during their whole live, others prefer change. In today's world things however evolve so quickly that keeping a same job with the same content for ever has become impossible. As needs change, job content changes over time. Therefore we all have to accept that constant learning and adapting to change is a must.

2. What career opportunities does the chemical industry offer?

A very broad range is available for all kinds of background education. Functions in the industry to be fulfilled are, in a non-limitative way:

- 2.1 Research and Development of new products and services.
- 2.2 Manufacturing.
- 2.3 Logistics and supply chain.
- 2.4 Procurement (buying of raw materials, equipment, goods and services).
- 2.5 Marketing and sales.
- 2.6 Communication.
- 2.7 Finance & administration (Human Resources, accounting, etc.).
- 2.8 General management.
- 2.9 Education: training and development of staff.

Some of these functions are fulfilled solely within the industry itself, others are "outsourced", this means performed by third parties under service contracts. This is often the case in supply chain and logistics, communication as well as recurrent administrative tasks.

Regardless the segment of activity which youngsters may select for their future, building a successful career or enjoying an interesting and rewarding job goes together with being prepared for multidisciplinary team work, have a mindset open for communication and for constantly integrating new technologies. As these characteristics are typical for the younger generations, this is an open invitation for boys and girls to go for STEM education and join the chemical industry, once the academic training is finished.

3. What are supply and logistics chains? What is special in chemical supply and logistics chains?

3.1 **Supply chains** look at the flow of products and processes from the stage of raw material to the transformation of the molecules into intermediate products which, in turn, serve as feed-stock for other industries until the end- product stage is reached, ready for end-consumer consumption. Each step creates value, which is why the term "value" chains is also often used to designate supply chains.

The **petrochemical supply chain**, for instance, consists "*upstream*" of the extraction of crude oil and natural gas from the reservoirs located underneath the surface of land or the

sea-bed, followed by the transformation of these hydrocarbon molecules through the refining industry into a range of intermediate products such as naphtha and associated gases.

These serve, in turn, as feed-stock for the petrochemical industry which "cracks" these molecules into olefins and aromatics in their cracking installations.

These then serve further as feedstock for "downstream" applications that end up in a variety of end-consumer products such as shampoo bottles or food packaging, foot - and sportswear as well as footballs and tennis rackets, fashionable eye-glasses, aspirins, artificial hips, medical equipment, fridges and dish-washing machines, fibers used in fancy clothes, cosmetics and health care products, car tires, mobile phones or tablets, only to name a few.

Supply Chain Management (SCM) is an evolving discipline. The concept was used for the first time last century in the sixties at the Massachusetts Institute for Technology (MIT) in Boston, USA, in the work of Jay Forrester. He defined SCM as "interactions between flows of information, materials, workforce and capital equipment". In the eighties within commercial companies different departments like distribution, logistics and transportation - that were not connected with each other- started to collaborate. Walmart and P&G (Procter & Gamble) took SCM initiatives like the Replenishment Programs which was the beginning of turning SCM concepts into practice. In the nineties the Supply Chain Council was formed and it developed cross-company metrics and approaches to track the information and material flows as defined thirty years earlier by Jay Forrester. Today, SCM is considered common practice in Europe and the USA and also in the rest of the world with the increasing globalization.

3.2 Logistics consist of the movement, handling, storage and delivery of products between suppliers, producers and customers. They comprise, in a non-limitative way, transportation (whether by truck, train, barge, ship or airplane, or some, or all of these modes during a trip from supplier to customer), packaging, warehousing, order processing, up to and including invoicing and even payment collection. Individuals involved in logistics assure, for example, that when you order cosmetics or sun-protective creams via the internet, these products arrive at your home within the shortest possible delivery time. Sometimes they also see to it that you pay the invoice upon delivery.

3.3 What is particular to **chemical supply and logistics chains** is that **very special attention** and care is given during all these operations and processes to **health and safety, security and environmental impact reduction** for employees, service providers and customers as well as all stakeholders. In that connection the Chemical Industry's Responsible Care initiative addressed successfully this industry's commitment to sustainability. Purpose of Responsible Care is to improve health, environmental performance, enhance security and to communicate with stakeholders about products and processes involving both chemical production and, out of the factory fence, chemical supply chain and logistics performed by service provider companies.

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Related documents and links:

1. ***inGenious website*** : interview with EPCA former president Tom Crotty

<http://ingenious-science.eu/web/guest/my-job-explained-epca>

2. ***Film: "Chemistry: All About You"*** :

<http://www.chemistryallaboutyou.com/>

3. ***Previous talk2us chat reports:***

See inGenious website; XPerimania returns with talk to us

4. ***Statistics***

<http://www.cefic.org/Facts-and-Figures/Employment/Employment-in-the-chemicals-industry/>

<http://www.cogent-ssc.com/>

5. ***Careers***

<http://www.metierschimie.be/>

<http://www.lesmetiersdelachimie.com/>

<http://www.chemicalworldtour.fr/>

<http://www.suschem.org/publications.aspx> (see 9th item on the list)

<http://www.shell.com/graduate>

<http://www.nationalstemcentre.org.uk/elibrary/collection/273/see-where-they-can-take-you>

<http://www.soci.org/>

<http://www.essencia.be/>

<http://www.futuremorph.org/16plus/play/science-and-maths-see-where-they-can-take-you/>

<http://www.slideshare.net/cbsquared/where-can-science-take-you-talk-for-henley-high>

http://www.mun.ca/science/future/career_development.php

<http://www.19ecolesdechimie.com/>

6. ***Supply and logistics chain***

http://en.wikipedia.org/wiki/Supply_chain

<https://en.wikipedia.org/wiki/Logistics>

http://www.supplychain247.com/article/mastering_the_skills_required_for_todays_new_basics_of_supply_chain

7. ***EPCA reports***

7.1 Report 46th EPCA Annual Meeting - p. 4,5,6,7,8, 9,10

<http://www.epca.eu/content/Publications/AnnualMeetingReports/docs/AM2012Report.pdf>

7.2 Report 45th EPCA Annual Meeting - p. 15,16,17,18,19

<http://www.epca.eu/content/Publications/AnnualMeetingReports/docs/AM2011Report.pdf>

7.3 EPCA Supply Chain publications

<http://www.epca.eu/content/Publications/SupplyChainWorkshopReports/default.asp>

<http://www.epca.eu/content/Publications/LogisticsSeminarReports/default.asp>

<http://www.epca.eu/content/Publications/LogisticsReports/default.asp>

<http://www.epca.eu/content/Publications/ScholarshipReports/default.asp>

<http://www.epca.eu/content/Publications/LogisticsMeetingReports/default.asp>

8. *Responsible Care*

www.icca-chem.org

www.cefic.org/Responsible-Care/

www.ecta.be/

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