# IUPAC SAFETY TRAINING PROGRAM

# AT

# NATIONAL SILICATES, TORONTO, CANADA

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# BY


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## 1.0. Introduction

I was given an award to participate in the 2015 Fellowship Safety Training Program following the ongoing innovative partnership between the International Union of Pure and Applied Chemistry (IUPAC) and the U.S. Department of State. This program aimed at training qualified chemistry professionals on chemical security, safety and environmental protective measures, by visiting and working with an IUPAC affiliated company in order to promote interactions between developed countries and the developing world and to disseminate state-of-the-art knowledge on safety and environmental protection in chemical production.

National Silicates located in Toronto, Canada was my host company and I had multiple privileges of visiting several other companies ranging from Chemical, food and waste management industries with a government ministry. These rare opportunities were borne out of the interest and pro-active nature of Lynda Ryder (My host) and Dr. Bernard West as a result of their passion for greener environment and reducing risks associated with industrial chemical production, it was indeed an overwhelming experience.

## 2.0. NATIONAL SILICATE-(HOST COMPANY)

National Silicates (NS) is a wholly owned Canadian subsidiary of the PQ Corporation. The PQ Corporation in conjunction with its affiliates is the world's largest producer of sodium and potassium silicates and its derivatives. National Silicates is the first non-U.S. subsidiary of PQ Corporation with vast experience in the chemical manufacturing industry beginning in 1831, a full century before it was founded and has been serving customers in Canada since 1931.

NS is headquartered in Toronto, Ontario, with production and distribution facilities for sodium and potassium silicates in Valleyfield, Quebec; Toronto, Ontario; Fort Frances, Ontario; Whitecourt, Alberta; Surrey and Parksville British Columbia. Liquid Magnesium sulphate, commonly known as Epsom salt, is produced in Surrey, BC.

National Silicate's (PQ's) Unique Chemistry and Innovative Solutions have high concerns for processes and systems that are:

- Non-polluting
- Conserving of energy & natural resources
- Economically efficient
- Safe and healthful to workers, communities and consumers
- Socially and creatively rewarding in order to sustain its business and protect the environment and its communities.

NS has its Centre for Pulp & Paper Excellence & Drilling Fluids in Toronto, Ontario. As the name of the Global Technical Centre implies, it deploys its technical and commercial expertise in support of other PQ units worldwide. The NS laboratory and technical services focused on reducing overall chemical bleaching costs. This Technical Centre is staffed with highly trained scientists who engaged in both research and development, as well as technical services. The laboratory situated at valley field conducts the quality control systems of its products to ensure conformity with required standards and specification.

**Industrial Applications of NS products:** The environmentally friendly nature of sodium and potassium silicates and magnesium sulphate in combination with a distinct set of chemical properties, makes these products well suited to a vast and growing number of industries and end-users including: Pulp and Paper, Water Treatment, Peroxide stabilizers, Oilfield, Detergents core and tube manufacturing, etc

National Silicate's commitment to Health, Safety and Environmental performance is an integral part of its business and is essential to its long-term sustainability goal. NS is a member of the Chemistry Industry Association of Canada (CIAC), committed to Responsible Care® and is registered to the ISO14001 and ISO 9001 Standards.

## 3.0. COMPANIES (PLANT SITES) VISITED

The table below indicates the types of companies visited (during the fellowship), their corresponding operational activities and services.

| Category/type | Name of Industry | Activities |
|---|---|---|
| Chemical manufacturers | National Silicates: Toronto, Montreal and Philadephia plants (HOST COMPANY) | Producer of Sodium and Potassium Silicates. |
| | Fiat Chrysler Automobiles, Toronto | Producer of Aluminum die casting, pistons, front and rear cross membranes for automobiles |
| | H.L Blachford, Toronto | Manufacturer of stearates, metallic soaps and supplier of anti-tack coatings |
| | Canada Colour and Chemicals (CCC) –Brampton, | Distributor of thousands of industrial and food chemicals, solvents, coatings, polymer additives with oil and gas |
| Food manufacturer | Campbell Company of Canada-Birmingham, Toronto | Producer of soups and other finished food products |
| Waste Management Industries | Clean farms, Ontario | Management of Agricultural wastes |
| | Stericycle ULC, Brampton | Management of Hazardous wastes |
| | Emerald Waste Energy | Management of Non-Hazardous Wastes |
| Government | Ministry of Environment and Climate Change. | Responsible for Environmental Policies, Implementation of the |

| | | |
|---|---|---|
| | | Toxic Prevention and Pesticide Acts. Promotes Environmental Sustainability. |

## 4.0. **SAFETY PROTOCOLS AT NATIONAL SILICATES**

**4.1. Responsible Care (RC) -** . Responsible Care is the chemistry of industry's' response to public concerns about the potential effects of products and processes on people's health and environment and future. The mandate of Chemistry Industry Association of Canada (CIAC) is to establish a competitive environment of business of chemistry in Canada. The Ethics, principles, codes and guides of Responsible Care with its interrelated components were extensively taught. The RC ethics is committed to do the right thing and be seen to do the right thing. The codes of practice are: Operations, Accountability and Stewardship. NS has its internal verification tool with its self-healing management ethic driven, based on the Plan Do Check Act cycle for continual improvement

**4.2. ISO 14001 Verification Audit**: National Silicates employs risk-based criteria for assessment and control of Environmental Aspects and Impacts. The company has an established document to maintain and continually improve the Environmental Management Systems (EMS) in accordance with the requirements of International Standards. The ISO14001 Manual provides a high-level overview of the National Silicates ISO 14001 management system. It is an electronically controlled document and accessible to all NS personnel. Procedures such as Aspect and Impact Analysis, incident investigation and risk identification are integral part of the ISO 14001 documents which are subject to reviews and update as necessary. NS has created and continues to create systems and practices to drive for continuous improvement in the Health Safety and Environment (HSE) areas.

### 4.3. Risk Assessment

Risk identified, is checked and controlled. The risk matrix is used to determine the level and category of risks for informed management decision. An Emergency Response Plan (ERP) is also put in place to protect the workers, community and the environment and also minimize/prevent loss or damage to property. Proper signage and unidirectional flow of forklift movements were evident on production sites to prevent accident at work.

### 4.4. Chemical Storage:

National Silicate maintained adequate storage areas for all its chemical raw materials and finished products. Combustible and oxidizing chemicals are properly segregated from all other classes of chemicals and stored in a separate storage area made up of fire proof containment to ensure safety containment in the incident of spark or fire outbreak.

### 4.5. Transportation of Dangerous Goods:

The NS ensures strict compliance with all requirements governing the transportation of hazardous chemicals from one location to the other. This includes appropriate labelling information with reference to its Safety Data Sheets and the United Nations Globally Harmonized System of classification and labelling of Chemicals (UN-GHS).

### 4.6. Incident Reporting:

The company maintained documented procedures for all chemical incidents/accidents that may occur at any point during plant operations and have adequate Standard Operating Procedures (SOP) for reporting and responding to chemical incidents.

### 4.7. Emergency Response Plans:

Emergency Planning is required to ensure maximum safety of employees, contractors and visitors. It protects the community, environment; and minimize loss of or damage to property. There are clear designated emergency areas and emergency response assembly area. The Emergency Control Officer (ECO) controls and direct all activities related to emergencies.

Fire Safety Plan (FSP): The FSP is designed to provide occupant safety in the event of fire, to provide effective utilization of the fire safety features of the building and to minimize the possibility of fires. This plan discusses what occupants are to do in the event of fire, fire safety protocols, supervisory staff and related duties, and other related issues. The FSP also assists firefighters in the performance of their duties, by providing floor plans, building and tenant information if an emergency ever occurs.
The ERP includes Emergency caused by human activities (Fire, Spill, critical injury), Bomb threats, Nuclear Gauges, Evacuation, etc

### 4.8. Medical Examination

Health and Safety of all workers are of highest priority to NS. Medical fitness is conducted for all staff depending on their different exposure scenarios at work. Hearing and respiratory tests are conducted for staff in production floor in addition to other medical tests conducted.

## 5.0. Other Companies Visited

### 5.1. Chemical Manufacturer

- **Fiat Chrysler Automobiles (FCA)**

FCA produces aluminum die casting, pistons, front and rear cross membranes for automobiles. The company has a robust Job Safety Risk Assessment (JSRA) in place which is assessed based on severity, probability and mitigation control parameters. The

components of the JSRA includes: identifying the risks, Assessing the risks, developing appropriate counter measures, implementing the counter measures, monitoring and horizontal expansion with continuous improvement activities to reduce risk. ERP is in line with type of incidents and is readily available for prompt compliance by all company staff. EMS is incorporated into Chrysler operational activities in order to prevent environmental contamination and degradation.

- **H.L Blachford, Ontario**

Blachford is a manufacturer of stearates, metallic soaps and other chemical based products. The company is leading supplier of anti-tack coatings and process aid designed to facilitate and enhance the rubber manufacturing process. Over the years, the company has made use of statistical methods to improve its process capabilities and quality of products. The company's products are multifunctional, ranging from plastic processing industries, pigment dispersion, water repellant in cement and concrete blocks, anti-agglomerates in animal feed, fertilizer, spices, etc. The company has got different safety procedures for its operations using different ranking parameters.

- **Canada Colors and Chemicals (CCC)-Brampton**

CCC is an independent distributor of chemicals in Canada, It has warehouses located in Brampton, Windsor, Montreal, Vancouver and Leduc with a sulphuric acid manufacturing plant in Elmira Ontario, and a Colour Concentrate plant in Colborne, Ontario. CCC Chemicals is a full service provider of over 5,000 commodity and specialty products, servicing businesses in the industrial and solvent sector, food and fine chemicals, coatings and polymer additives, oil and gas, soap and detergent, mining, pulp and paper, environmental and water treatment markets.

The company has a robust safety mechanism in place with a committed to safety database, which is an online platform that employees could login and make comments, complaints, suggestions and is accessed directly by the president and Health and safety coordinator. This online platform also helps the management of CCC to appraise all plant safety practices system, staff rewards and other plant operations and processes.

### 5.2. Food Manufacturer/Distributor

**Campbell Company of Canada-Birmingham, Toronto**

The company is committed to meeting the dietary needs of Canadians with gluten free products and engages in community programs. Its products are low in sodium but more serving whole grains, vegetables, and increased in Vitamin D content. Its food production processes involves: mixing, blending, pasteurization, sterilization, filling, capping, coding, and packaging. Its operations are automated with stainless steel operating equipment. Human contacts are reduced to its barest minimum, and protective clothing's worn by all production staff. Safety of food raw materials and finished products were maintained by

adhering to specified storage conditions, production processes, appropriate dress code, Good Hygienic Practices (GHP) and responsible use of sanitizers. The floors were clearly marked with signage symbols for both personnel and fork lifters to prevent accident on site.

### 5.3. Waste Management Companies

- **Clean farms-Etobicoke, Ontario**

Is a not-for- profit industry stewardship organization committed to environmental responsibility through proper management of agricultural wastes. It has standard operating procedures for collecting and safely disposing obsolete pesticides, seeds, pesticide bags and recycling of empty agrochemical containers. The Standard Operating Procedures involves the farmers gathering all agricultural wastes at specific collection sites which are further transported to the destruction/incinerating sites.

- **Stericycleinc. ULC. - Brampton**

It is a waste management company with sites located at Armthrope and Derhurst. The Armthrope site is responsible for the collection of hazardous wastes and its segregation. The hazardous wastes which includes biomedical wastes are transported to the hazardous waste management site at Derhurst for incineration. The incinerator is attached to a pollution control unit device and operated at a very high temperature.

- **Emerald Waste Energy:**

This company specializes in the management of non-hazardous wastes. The wastes are incinerated and steam generated are further converted into electricity. The waste management companies have adequate safety management systems corresponding to their level of operations. The waste management facilities have appropriate Personnel Protective Equipment for all different levels of operations and the entire process is electronically monitored and controlled.

### 5.4. Government

**Ministry of Environment and Climate Change (MOECC)**

The Ministry of Environment and Climate Change focused primarily on preventing all actions and activities that will negatively affect/pollute the environment. The ministry employs modern regulatory principles and practices to ensure compliance with environmental policies and also implements the Toxic Reduction and Pesticide Acts. The ministry's ERP guides on how to respond to emergencies related to dangerous spills and other environmental polluting activities.

## 6.0. Lessons Learnt:

It was observed that **Safety** is given preference and reference in all company meetings and all companies visited practiced adequate safety protocols which included but not limited to the following:

1. All industries signed into the Responsible Care program and safety experiences are shared during bi annual meetings
2. All chemical production activities are monitored and electronically controlled such that evaluation results could be used for continual improvement.
3. Risk analysis is carried out based on process hazard levels and mode of operations.
4. Specialized Emergency Response Plans are based on different active or passive accidents/incidents
5. Segregated quarantine areas for holding Out of Specification products and standard operating procedures are available for handling obsolete and expired chemicals.
6. Internal verification and evaluation procedures to meet up with the international requirements of the different ISO standards.
7. All chemicals are stored according to required storage conditions specified in the Safety Data Sheets with oxidizers and combustibles stored in separate storage areas protected with fire proof containments
8. Pollution prevention principles with environmental sustainability is the watchword for the waste management facilities
9. Availability of robust fire safety plan, and adequate firefighting equipment strategically located within the different plants.
10. Availability of signage and suitable/adequate Personnel Protective Equipment (PPE) for different factory operations.
11. A high level of Good Hygienic Practice (GHP) with focus on Hazard Analysis and Critical Control Points (HACCP) was displayed at the food industry.
12. Online and class room trainings for all new employees and retraining procedures conducted as need arises.
13. Staff medical examination is specific to their different exposure scenarios at work and ear protection were provided for all staff working in noisy environment

## 7.0. Plan for Nigeria

1. Experiences and knowledge gained would be shared amongst colleagues for effective and improved chemical inspection regimes to further promote industrial safety practices and environmental sustainability.

2. Training needs for stakeholders in the chemical industries would be identified and recommendation would be forwarded to my Director for consideration and possible implementation strategies.
3. Create awareness and promote the campaign against re-use of empty pesticide containers, obsolete agrochemicals and proper disposal of same
4. Develop an incident reporting and ERP documents for use in industry inspections (and encourage industries to do same) in order to promote incident reporting and response cultures from the safety standpoint.
5. Create awareness and promote industrial internal self-audit systems in line with the international best practices for improved safety protocols and EMS through industrial inspections.
6. Promote and create awareness on the need for chemical companies to establish (maintain) functional ERP plan for chemical spill, critical injuries, Fires etc.
7. Promote the behavioral and attitudinal changes of companies to maintain documented evidences of all obsolete and expired chemical substances.
8. Promote the use of proper signage systems on industries during inspections and monitoring activities
9. Create awareness on the need for industries to meet and share safety experiences in order to achieve continuous improvement and safety practices in Nigeria.
10. General awareness creation of chemical safety protocols to the public through media and safety hand bills/brochures.
11. A summary report and recommendation of the entire fellowship safety program will be submitted to my agency for its information, consideration and possible approval for effective implementation, which will further help strengthen Nigeria's chemical regulation and control system from the safety standpoint

**8.0. Suggestions.**

A database may be created to accommodate both past and current follows, such that fellows could log on to the platform, share successes and challenges in the course of implementing different safety protocols in home countries. Also share new ideas which will encourage easy networking amongst all Chemical Safety Fellows.

**1.0. SUMMARY**

National Silicates is dedicated to ethical and moral business practices and its commitment to business sustainability is a prime focus of her path forward. Responsible Care initiative serves as a model for industry around the world that economic success does not have to come at the expense of human health and environment

**10. Conclusion:** It is not out of place to be passionate about safety, protecting the environment and fighting climate change, hence tools for tackling them should be effective on a global scale: **Special thanks therefore to IUPAC and USDOS for this global safety initiative**


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