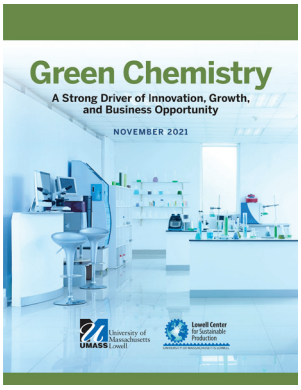
VF Corporation and the Application of Chem–IQ℠ in the Supply Chain

VF Corporation is a global apparel conglomerate and owns many big brands including Vans, The North Face, Timberland, JanSport, Eagle Creek, and others. Frank Opdenacker and Harsha Chenna are two PhD's in chemistry who have been active in the safer chemicals world for a long time while working at the VF Corporation. VF's green chemicals team is based in Belgium, Switzerland, Hong Kong, and Denver, Colorado, and the team is focused on compliance-related activities in all aspects of chemistry, including product, chemical management, safety, labor, and marketing compliance. The compliance team is focused on ensuring that the company seeks to replace chemical formulations with safer alternatives, which are safer to consumers, operators, and producers, while minimizing the negative impact on the environment. The reach of the compliance team extends out to tier 3 and 4 suppliers, seeking to improve community development, traceability, and transparency.

QUICK FACTS

- VF Corporation was founded in 1899
- Global apparel and footwear company
- Over 50,000 employees and revenues exceeding $13.8B
- HQ is in Denver, Colorado
- Has over 300 brands categorized into Outdoor, Active and Work including The North Face, Vans, and Timberland

One of the proudest achievements of Opdenacker and Chenna is their involvement in helping to develop and shape the Chem–IQ program. This is a program that screens chemicals and auxiliaries at their point of use in the supply chain. Opdenacker notes that "Chemical management is okay, but unfortunately there is not enough information on all of the chemicals that are used in the supply chain. Many producers don't know which chemicals went into their products at earlier stages upstream in the supply chain. In 2011 the REACH regulations came into play in Europe, which requires that chemical manufacturers collaborate with their supply chains to disclose chemical uses. We



Excerpted from ***Green Chemistry: A Strong Driver of Innovation, Growth, and Business Opportunity***, University of Massachusetts Lowell, November 2021

https://greenchemistryandcommerce.com/publications

knew that if we only relied on information provided by chemical suppliers or their MSDS sheets, the information would not fully identify what chemicals were used. Even if you were off by 0.1%, it would not be okay, because chemical substance levels down to the level of Parts Per Million (PPM) really matter!"

Opdenacker then relates what happened. "So, a group of us chemists were sitting around back in 2011 and we started to dream. One of us asked 'Wouldn't it be great to have a way to screen the chemicals that go into our apparel products, and we'd know right away if we have an issue with water, air emissions, solvents, or whatever? We started to brainstorm on how to develop such a thing. We envisioned some type of a "litmus paper in solution" approach, which automatically shows a color that indicates the analysis results. We then started to think about what analytical technology would tell us what is in the product, which would allow us to make a decision based on the result. This led to a Gas Chromatography[1] Mass Spectrometry (GCMS) screening program that could provide information on the chemistries present in a product. At this point, a group of chemists began working with the University of Leeds and others to develop the system and we decided the best place to start would be to begin by looking at our own factories and our own chemicals."

Once this group of chemists began using GCMS to examine their own products, they very quickly found chemicals that they realized should be replaced. "We wanted to avoid a lot of substances in our products, including chemicals of concern, those identified in Proposition 65,[2] and many others. This led to the identification of thresholds for different chemicals. For instance, if a particular chemical registered at 5 to 7 PPM, it was deemed to be "yellow," where if it exceeds 7 PPM it was labeled "red." This resulted in a simple screening of different chemicals. Anytime one saw a red result, the action required was to contact the chemical supplier to improve on or find an alternative, which would lead manufacturers to produce a safer and better product. In many cases trade-offs had to be resolved. Many people wanted the solution to be as cheap as possible. If a safer solvent alternative increased the cost by $10 per kg, perhaps raising the product cost by 20 cents, then no one would want to use the safer solvent. But at least this began to raise the issue and we could begin to have the dialogue."

Fast forward ten years and VF decided to take the lead in developing a Restricted Substance List (RSL), which identifies prohibited or limited substances for all products and is overseen by their Product Stewardship Team.[3] The key to this approach was the development at VF of CHEM–IQ —a unique proprietary chemical management system that prevents substances of concern from

1 Gas Chromatography is an analytical technique in which a complex mixture of compounds is injected onto a column and is separated based on their relative boiling point and affinity for a chromatographic column.

2 The list contains a wide range of naturally occurring and synthetic chemicals that are known to cause cancer or birth defects or other reproductive harm. These chemicals include additives or ingredients in pesticides, common household products, food, drugs, dyes, or solvents. Listed chemicals may also be used in manufacturing and construction, or they may be byproducts of chemical processes, such as motor vehicle exhaust. https://oehha.ca.gov/media/downloads/proposition-65//p65list12182020.pdf

3 https://www.vfc.com/sustainability-and-responsibility/chemistry

entering VF's supply chains. Through CHEM–IQ, chemists at VF have identified and removed more than 400 tons of non-preferred chemicals from their supply chain. CHEM–IQ doesn't limit chemistry creativity but is viewed as an enabler to accelerate product innovation in line with VF's green chemistry principles, reducing hazardous waste from product design to final production. In 2017, VF made the CHEM–IQ Program Manual available to other manufacturers so they could share its breakthrough benefits. Many players in the apparel sector are now using CHEM–IQ and VF to explore new ways to extend its use throughout the textile supply chain.

CHEM–IQ has also served as a means for continuously improving the levels of green chemicals in VF's supply chains. The system measures chemicals at their point of use and leads to chemists searching for ideas to create better chemistry. The development team began by seeking to eliminate all the products that had known identifiable issues. They screened some 40,000–50,000 chemical formulations and found that about 10% had major issues, and another 30% had minor issues. These changes could not be implemented over night, so the goal is now to maintain a consistent approach to continuous improvement, with the goal of eventually removing all non-sustainable chemicals and replacing them with better chemicals. Every year VF's supply chain gets better and moves on to the next tier of chemical improvement.

Opdenacker notes that "The basic principle of green chemistry is to minimize the use and formation of toxic chemical substances and design products in a way that minimizes harm. We want to prevent bad things from happening and prevent harmful substances from being used in the supply chains. We know this can't happen all at once, and there are no perfect chemicals, but that shouldn't stop us from continuously improving our use of green chemistry to lower our footprint in the supply chain. That is also the message we consistently communicate with our suppliers." VF's list of unsafe chemicals is up to 420, but there is concern that it is not VF's role to manage the governance of this list. Opdenacker believes that the assessments and maintenance of this list belongs in the domain of NGO's and universities.

Oddly enough, if VF identifies materials in the supply chain that are non-compliant and notifies their suppliers, the suppliers are happy to hear from them. In many cases suppliers were unaware of the problem and are keen to address VF's concern. Replacing an unsafe chemical is a value-added activity, as it might be helping the supplier avoid non-compliance fines of hundreds of thousands of dollars versus what the original chemical cost. In some cases, chemical suppliers approach VF with a problem and note that to reach a specific level of purity, investments will be required for the specific equipment. In other cases, there was no prior knowledge that the chemical of concern was present, and substantial design work will be needed which may incur costs. However, if all suppliers are involved together to pursue safer chemicals, increased volume usage will drive down costs and equalize the playing field. Not all suppliers can afford significant investments in new equipment, etc. for green chemicals, but in 95% of the cases changes can be made to clean up the supply chain. The CHEM–IQ solution provides an ability for all suppliers to screen their products for green chemistry.

CASE STUDIES

The use of green chemicals in the apparel supply chain is increasing significantly. Large companies like VF, Nike, ASICS, Adidas, Decathlon, Gap, H&M, and others are coming together in an organization called the AFIRM Group,[4] whose mission is to reduce the use and impact of harmful substances in the apparel and footwear supply chain. This is a good forum for bringing together 27 major apparel and footwear brands to drive scale in green chemicals by working together towards common standards. There is significant consensus among the top brands regarding the non-compliance issues that leading to increased scale and volume growth of green chemicals. Each brand publishes the methods that they are using for different types of chemicals, to share best practices. This is not a competition, but rather a way for brands to use their footprint to focus on the top harmful chemicals that comprise the largest volumes currently in use to compete horizontally as an industry to promote green chemistry.

Most apparel suppliers when they develop new products focus on screening of chemicals. More and more are relying on the CHEM–IQ screening tool, as it provides information that they would never have known unless they had gone and conducted an analysis on every chemical in their product. VF acknowledges that a screening is the not the perfect analytical method but is useful for understanding if potentially problematic chemicals present are in a range that is acceptable. There is significant variation in chemical that are typically produced in batches, and there may be differences in the amount of harmful chemicals present. So, from a statistical perspective the screening is not perfect, but is intended to provide a lot of useful information to reduce the footprint of harmful chemicals overall.

A good example is Alkylphenol ethoxylates (APEOs—often called alkylphenols or alkylphenols) which are surfactants that have an emulsifying and dispersing action, so they have good wetting, penetration, emulsification, dispersion, solubilizing and washing characteristics and have been in use for more than 50 years. However, there are concerns that they can affect aquatic organisms and are slow to biodegrade and tend to bioaccumulate. Europe has mandated that APEO's should be limited to around 50 PPM, and one of the applications of greatest concern is spinning oil, which is used in the weaving process. The oil is often present in a fabric because of its use in the supply chain. Screening for APEO's allows brands to go beyond the management of chemicals used in their own factories and can trace whether the chemical exists in processes that occur within the end-to-end supply chain. VF screened for APEO's but did not find any in the tier 1 or tier 2 supplier facilities though were able to find it using CHEM–IQ with a knitting and spinning supplier upstream and drove them to change the use of this oil in the process.

Other examples include the movement from a C8 chemistry to a C6 chemistry used in water and stain repellencies, as well as movement to restrict some silicone-based chemistries. There are many opportunities for improving chemistries, but the CHEM–IQ screening tool starts to drive the right behaviors up and down the supply chain. The tool will also help to educate more

4 https://www.afirm-group.com

consumers, who will push brands to answer more questions about the use of green chemistries in their products. There will always be a push-pull relationship between regulators and consumers for change, but the CHEM–IQ screening solution provides an objective way to identify problems and work towards continuously improving them over time.