The Evolution of VR® Alternative Personal Protection Apparel

The Problem

For the past several decades, Polyvinyl chloride ("PVC") personal protection garment shave been used by the Food Processing and other Industries as the products of choice when specifying economical limited-use, fluid-impervious protective work clothing. Known for its strength, flexibility and softness, PVC ("vinyl") film is used world-wide in the manufacture of disposable/reusable aprons, shoe covers, coats, and sleeves for the work environment. In recent years, however, there has been a preponderance of evidence indicating that PVC products can be carcinogenic.

In a document published by Greenpeace, "PVC poses a problem to the invornment and the health of human beings in all phases of its life cycle – from production to its disposal." From the viewpoint of the consumer, there are two major dangers in the use and disposal of PVC products:

1. USE – PVC contains plasticizers which are added to PVC to enhance and make the material extrudable, moldable, sealable, and acceptable for the intended end-use. Many plasticizers are considered as possible human carcinogens. Among them is Diethylhexylphthalate ("DEHP"), which in animal food additive experiments has shown a significant increase in liver tumors. DEHP is soluble in fat and fat-containing fluids such as blood. The migration of plasticizers such as DEHP from PVC products causes brittleness and alters the original PCV product surface. The continuous exposure of PVC aprons, sleeves, boots and coats to animal fat and blood magnified by their frequent hot water washes and chlorine rinses can facilitate the migration of plasticizers. Evidence of brittleness and surface alteration from frequent use may be cause for concern among employers. At stake is the safety and welfare of employees and the potential contamination of processed food product.
2. DISPOSAL – PCV begins to thermally decompose at approximately 250°F. Evolving toxic fumes of corrosive Hydrogen Chloride ("HCL") gas which when moisturized become Hydrochloric Acid. Incineration, in the absence of sophisticated controls will emit dangerous toxic emissions of HCL, chlorinated hydrocarbons, dioxins and furans. This is a life-threatening carcinogenic (cancer-causing) combination.

The Solution

PolyConversions, Inc., in Rantoul, Illinois has developed under the trademark VR® a *specially formulated* polyolefin material designed as an easy-to-recycle PVC film replacement called "VR®". Designed for those end-use personal protection apparel applications demanding comfort, durability and recycle-ability, VR® products represent cost effective alternatives to conventional PVC and other heavy duty barrier materials. Personal protection barrier products made from VR® offer superior strength and softness while lighter in weight (lower density) than PVC personal protection apparel. VR® is odorless, easier to clean for reuse and will not degrade to a brittleness that is a common characteristic of PVC after multiple uses and washings… VR® actually gets softer after repeated use. Contaminants such as animal fat and fat containing fluids rinse off easily at standard wash/rinse temperatures of 165-170°F.

VR® linear low density polyethylene material is formulated from polyolefin plastomer resins that incorporate the new metallocene catalyst technology. The material contains no toxic substances or plasticizers. Any decomposition of *non-toxic* polymers occurs at a much higher temperature than PVC. The strong bonding and reprocessing qualities of VR® products make for excellent recyclability especially when the VR® is recovered as a single-resin waste material and added as a supplement to LLDPE extrusion to enhance the strength and bonding qualities of products such as specialty bags and can liners. If recycling is not considered, VR® product waste can be safely disposed in sanitary land-fills and can be incinerated emitting only nontoxic carbon dioxide and water. With a high BTU value, VR® product waste makes an excellent feedstock for "resource recovery".

Three federal regulatory bodies (FDA, USDA and OSHA) impact on industrial applications of personal protection apparel.

Food and Drug Administration ("FDA")
VR® is approved by the FDA for direct food contact according to the Federal Food, Drug, and Cosmetic Act, 21 CFR 175.300. FDA however restricts the use of PVC in certain food containers due to the possibility of migration of vinyl chloride monomer into food products which tends to increase with the thickness of the PVC material. The USDA does not review formulations and substantiate claims and do not require the manufacturer's assurance of compliance who produce products that are not considered by USDA to be for direct prolonged contact with food products. However, since some product contact with food is unavoidable, the USDA does strongly recommend that the products be formulated in compliance with the FDA's food additive regulations. The USDA's position is that manufacturers of products that do have unavoidable, but not "direct prolonged", food contact provide a letter of certification to federally inspected plants that specifies compliance with FDA's food additive regulations. The performance of the products must be satisfactory to the inspector in charge.

Occupational Health and Safety Administration ("OSHA")
OSHA's personal protective equipment standards were revised on April 6, 1994. Under OSHA standard 1910.132, personal protective equipment should be used when hazards to process or environment, chemical hazards, radiological hazards, or mechanical irritants are encountered in a manner capable of causing injury or impairment to employees through absorption, inhalation, or physical contact. Employers are required to analyze the work practices to determine if hazards are present or are likely to be present that will necessitate the use of personal protection equipment. In selecting and using PVC personal protection equipment (apparel) and armed with the knowledge that PVC may in itself be toxic to employees and to food product, *employers may be unwittingly creating a hazard which would be subject to OSHA jurisdiction.* Under 1910.132 OSHA also mandates that defective or damaged PPE shall not be used! Reuse of PCV apparel which become brittle and suffers surface alteration after several washes and rinses could potentially violate this OSHA mandate.

In addition to the OSHA standard 1910.132, there is a new standard waiting to be promulgated which will make workers more aware of the relationship between themselves and their work environment. This new rule, called the Ergonomic Protection Standard, will enable workers to take an active role in *controlling* exposures to workplace risk factors. "Signal Risk Factors" related to musculoskeletal disorders will determine whether a workplace is subject to the proposed standard. Signal risks such as awkward work posture, its contributory causes and continuous motion patters will trigger the standards application. In the Food Processing Industry, there are work activities involving the same motion and potential awkward posture. The type and weight of personal protection apparel may potentially represent a contribution cause to awkward work posture and musculoskeletal disorder.

United States Department of Agriculture ("USDA")
The USDA's Food Safety and Inspection Service (FSIS) has proposed a new rule entitled "Pathogen Reduction: Hazard Analysis and Critical Control Point ("HACCP") Systems. In the 2/3/95 Federal

Register, FSIS proposed “requirements applicable to all FSIS-inspected meat and poultry establishments that are designed to reduce the occurrence and numbers of pathogenic microorganisms in meat and poultry products and to reduce the incidence of food borne illness associated with the consumption of those products.” Included in this rule are specific hygiene practices related to personal protection apparel with statements such as “Disposable personal items should be changes *as required* to assure cleanliness”. Reusable disposable items such as PVC apparel with obvious wear (brittleness and surface degradation) will have to be changed more often. In addition, clean outer apparel including boots will require mandatory changes or replacement between processing zones, (e.g. from a dirty zone to a clean area).

Summary

A growing amount of evidence is supporting the health and safety claims against PCV. The risks associated with the use and disposal of PCV products are very real! Exposure of PVC aprons, sleeves, boots and coats to animal fat and blood and the potential for leaching toxic chemicals must be a concern to both employees and employers. The replacement of PCV apparel with a non-toxic, non-carcinogenic recyclability of disposable or limited-use work wear. In addition, alternative work apparel made of VR® will promote compliance with FDA’s food additive regulations, OSHA’s personal protection equipment and ergonomic standards, and USDA’s HAACP rule.

PolyConversions, Inc. is urging companies in the Food Processing and related industries to order test samples of VR® apparel products to make their own comparisons. By doing this, a company will be demonstrating to regulators and informed employees that the company is advocating innovations that will improve health and safety in the workplace environment.

More information can be obtained from:

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