

**Safety-Kleen Corporation**

**Presented by:  
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## **Developing Product Take-Back Systems Through Solvent Recycling**

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Safety-Kleen Corp. has been involved in Extended Product Responsibility from the very beginnings of the company, well before the phrase became popular. Our company was founded on the concept of leasing a piece of parts washer equipment and the solvent needed to run it. This leasing concept was coupled with the periodic servicing of the machine and exchanging clean solvent for the dirty material. The company has developed many additional products and services on this concept. For example, we have developed our Oil Services systems to both supply a recycled/re-refined product and collect used oil after it is dirty and no longer useful as a lubricant. The Oil Services system is described in a separate case study. Both systems focus on providing not only materials, but more importantly, a timely service to the customers to help them deal with the used materials in an environmentally appropriate manner. This case study will examine the development of Safety-Kleen's Parts Cleaner system as it applies to the concept of Extended Product Responsibility.

### **Minimizing waste solvent volumes**

Name and Description of Project: Safety-Kleen initiated its enhanced product responsibility efforts with a solvent take-back program in 1968. At that time, the company introduced the concept of machine and solvent leasing in order to make it convenient and safe for the automobile repairman to do his parts cleaning. The customer would lease both the machine and the contained solvent, and Safety-Kleen would periodically return to service the machine and exchange clean solvent for the by-now dirty material. A schematic of the service is shown in the attached figure.

The design for the parts cleaner itself dates back to 1954. It was developed as one man's answer to the safety problems associated with his cleaning of parts in pans of gasoline at the family's sand and gravel business. The machine featured a solvent with an elevated

flash point, making it safer to use in the maintenance setting. It also had a lid that would be self-closing to snuff-out a fire in the event that one started. The name Safety-Kleen was used almost from the start since the machine was safe and it cleaned parts.

When the Safety-Kleen machine's patent was purchased from the initial inventor and the company from the subsequent owner, relatively few machines had been sold and the periodic service aspect was not emphasized. The concept of offering a total service including the use of equipment, solvent, and cleaning of the equipment on a regular service interval launched this successful business. The market, distribution network, and the infrastructure to support this new system were developed with a great deal of effort and forethought by the company founders. It filled a market's need. Safety-Kleen was expected to show up to do the service, and we did. The quality of the service was the key issue which allowed the other recycling services of the system to expand.

The closed-loop recycling system was born in 1970. Safety-Kleen introduced the concept of solvent recycling as a means of managing the used solvent and reducing the amount of virgin solvent purchased and used each year. The closed loop refers to the fact that Safety-Kleen delivers a volume of clean solvent to the customer and removes the dirty solvent which is sent to a company recycle center for recovery. The clean, recycled solvent is then returned to the customer on the next service, closing the loop. By 1975, the company was processing over 10 million gallons per year of parts cleaner solvent. Over 90% of the spent solvent was recovered into a recycled product which was re-delivered to the parts cleaner customers. By 1993, customers were generating over 50 million gallons per year of spent parts cleaner solvent from almost 500,000 units at more than 300,000 customer locations in the United States.

In 1993, the evolution of Safety-Kleen into extended product responsibility and take-back continued. A new parts cleaning machine was introduced that was designed to minimize the amount of waste solvent generated, and thereby reduce the amount of clean solvent used. The new service employs a premium solvent with a higher flash point and much tighter specifications on organic impurities. In addition, a patented cyclonic separation technology that continuously removes dirt particles from the solvent during use was integrated into the company's waste minimization parts cleaner - the Green Machine. The company spent more than \$2 million and over 4000 man-hours developing and testing the efficiency of the new product.

With the new cyclonic parts cleaner service, customers need service less frequently and generate less waste on an annual basis. The solvent stays cleaner longer, extending the life of the solvent and reducing the number of annual solvent changes. Green Machine customers generate between 50% and 80% less waste with the same parts cleaning capabilities. In 1995, customers generated 11 million fewer gallons of waste parts cleaner solvent as a result of the waste minimization features of the new service. Due to the purity of the solvent, careful use allows the solvent to remain non-hazardous even when returned for recycling.

Project Participants: Safety-Kleen has worked closely with our parts cleaner customers to develop and refine the service system. The types of customers range from small service stations and auto dealerships to a wide variety of medium to large industrial facilities. Customers in the Washington D.C. area include the White House Motor Pool, the CIA, several military bases, the Smithsonian Institution, and the U.S. Mint.

Project Goals: Back in 1968, the primary goal in developing this service was, obviously, creating a system that generated profits. This was to be done by taking advantage of small business customers' needs for a parts cleaning system that was convenient, safe and cost efficient. At the same time, we realized that a new system was needed to give the users a viable alternative to pouring the dirty solvent down the drain or out in the back yard. The solvent take-back system met those goals.

In 1970, providing a means to recycle the dirty solvent became a major goal. Expenditures for virgin solvent supplied with each service were driving up costs. This goal was met by creating the first Safety-Kleen solvent recycle center in Elgin, Illinois, and has grown to a total of 7 Safety-Kleen facilities recycling parts cleaner solvent. The recycling process allows over 90% of each gallon of dirty solvent to be returned as clean solvent for each future service.

Project Drivers: There were several issues driving the development of the initial parts cleaner system. Safety was a key concern of small business people who needed to clean parts and had concerns with open containers of solvent or gasoline. They also wanted a system that they could use and forget and not invest their own time and effort in maintaining and servicing the equipment. The main issues were safety, convenience, and reliability, all in a cost efficient package.

New environmental laws have also served as project drivers. The Resource Conservation and Recovery Act (RCRA) brought with it the concept of “cradle to grave” management of wastes. This caused businesses, especially the smaller ones, to look for a service provider that could give them peace of mind as to how the waste was being managed. Later, the liabilities associated with Superfund caused the users to look for waste management partners who could ensure that their wastes were handled in a safe and secure manner. Safety-Kleen has lived up to this promise, protecting its customers from Superfund-like liability associated with the handling of spent solvent material.

In 1990, Congress added pollution prevention concepts into waste management laws. The Pollution Prevention Act of 1990 introduced a waste management hierarchy that placed “source reduction,” or not producing the waste in the first place, at the top of the ladder. If wastes could not be prevented, they were to be reused, recycled, treated or disposed, in that preferential order. The take-back and recycling nature of the Green Machine with its extended service interval provided customers with credit for pollution prevention and source reduction.

Project Benefits: Integrating the parts cleaner machine with a take-back solvent service has provided many additional benefits. It has significantly improved safety in most of the maintenance shops in the U.S. by reducing the risk of fire from parts cleaning operations. The service has conserved non-renewable oil resources by reducing virgin solvent purchases through an effective closed loop recycling system. Waste generation volumes have been reduced substantially, allowing customers to take advantage of reduced regulations on smaller waste generators. The system also reduces impacts on surface and ground waters by providing a means to appropriately manage the solvent rather than pouring it into the sewer or onto the ground. The company also benefits financially from this system since the fully loaded cost of producing a unit of recycled solvent represents a 30% savings compared to producing the solvent from virgin stocks.

Project Obstacles/Barriers: Development of the original parts cleaner system was challenged by the historic lack of a nationwide distribution system to service the machines and recycle the solvent. Safety-Kleen overcame this by creating a multi-layered distribution system that is able to move large volumes of materials in both bulk and container volumes to almost any location in the continental U.S. and recover it, even down to a single drum from an isolated location.

Unfortunately, some RCRA regulations create significant storage and handling impediments to managing recyclable wastes. Safety-Kleen established its recycling system 16 years before RCRA started significantly influencing the parts cleaner business (1984). Since that time, significant money and effort has been expended to meet the regulations. A "contingent management" system for recyclable wastes could be much more cost-effective while ensuring equivalent levels of environmental protection.

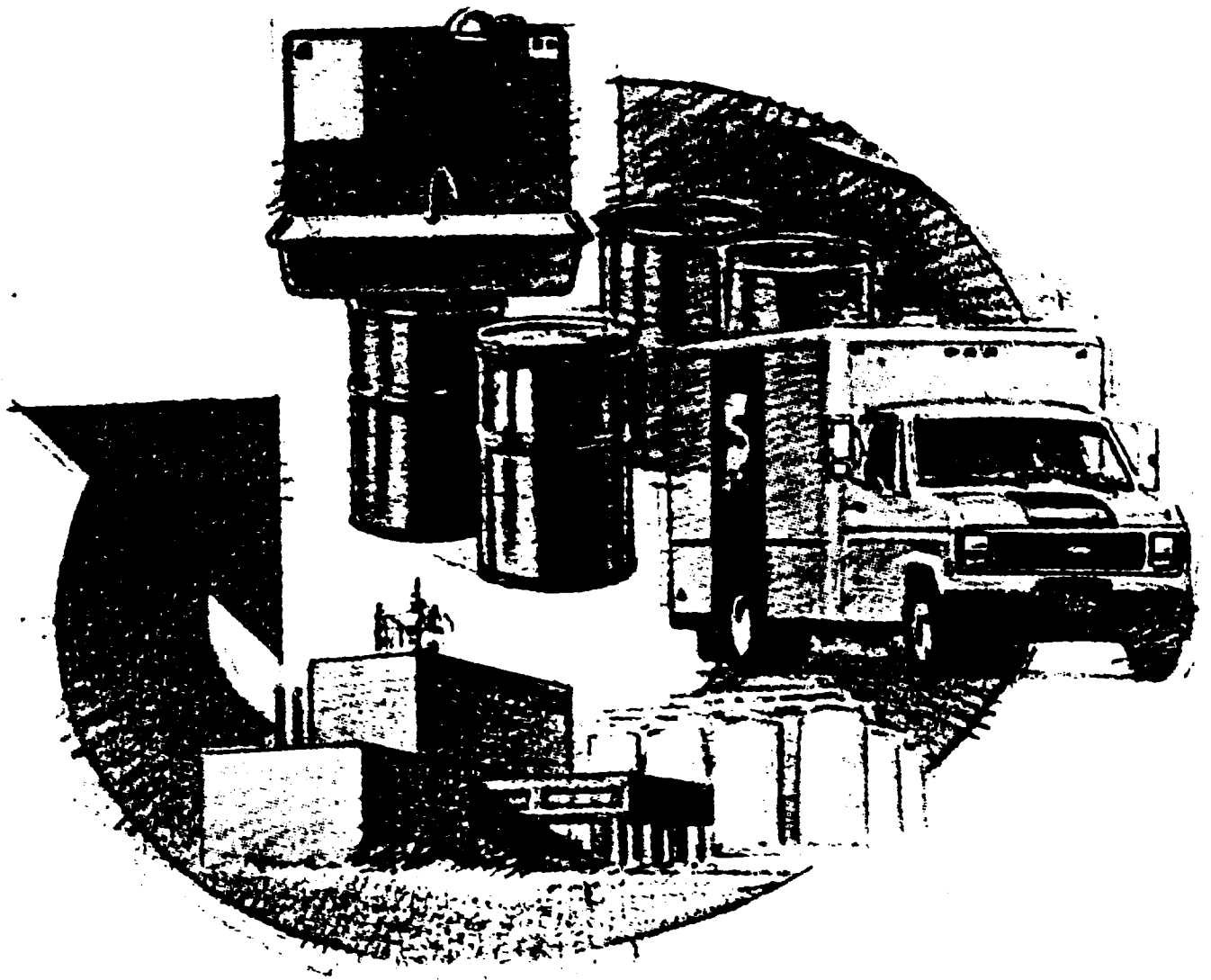
EPA's used oil regulations (40 CFR Part 279) have actually made it more difficult to promote solvent recycling. These rules make it easy for parts cleaner solvent to be mixed in to used oils and legally burned. This is inconsistent with EPA's waste management hierarchy, Pollution Prevention Strategy, and their 1993 Waste Minimization and Combustion Strategy. Consequently, many businesses have chosen the cheaper burning outlet over the more environmentally preferable recycling and reuse option.

The new generation of waste minimizing parts cleaners has also created challenges in addition to the benefits. Costs of the cyclonic Green Machine are nearly twice that of the original parts cleaner machine due to the higher technology employed. In addition, the new non-hazardous, higher flash point solvent does not always meet the parts cleaning needs of all customers. The company continues to explore methods of meeting these challenges.

Project Reviews: The waste minimizing Green Machine has been selected for several awards, including its selection by Plant Engineering magazine as one of its "Products of the Year" for 1994. The machine has received the Michigan's Chamber of Commerce Environmental Quality Award and the Wisconsin Governor's Award. The unit has also been recognized by the U.S. EPA as a waste minimization product in its Waste Minimization Plan issued in November 1994.

## **Summary**

Providing our customers with the opportunity to participate in product take-back programs has been profitable for both them and Safety-Kleen. These programs encourage the conservation and reuse of non-renewable natural resources, provide the generators with convenient options to improve the environment by managing the wastes appropriately, and meet a growing demand by our customers for "green" products and services that can be translated into improvements in their bottom lines.



## **Developing a Product Take-Back Program Through Oil Re-refining**

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Safety-Kleen Corp. has been involved in Extended Product Responsibility from the very beginnings of the company, well before the phrase became popular. The Oil Services program supplies re-refined lube oil products and collects used oils after they are dirty and no longer useful as lubricants, an extension of the product take-back concept. The program focuses on providing not only materials, but more importantly, a timely service to customers to help them deal with used materials in an environmentally appropriate manner. This case study will examine the development of Safety-Kleen's Oil Services program as it relates to the concept of Extended Product Responsibility. A separate case study has been prepared describing the company's Parts Cleaner system.

### **Re-refining Used Oil**

Name and Description of Project: Safety-Kleen has developed a used oil management program that collects and recycles over 170 million gallons each year of used oil. A large percentage of this used oil is re-refined in Safety-Kleen's two re-refineries in the U.S. and Canada, which are the largest in North America. Safety-Kleen possesses over 80% of North America's total re-refining capacity. The re-refining process produces a base lubricating stock that is equal in quality to virgin base oils and meets all applicable standards in the industrial and vehicle markets. Safety-Kleen has spent over \$200 million on the plants and infrastructure to be able to bring this product and service to market.

About 1.4 billion gallons of used oil is generated by industries, businesses and consumers in the United States each year. Currently, only 900 million gallons of used oil is collected each year for processing. Of this, only 10% is re-refined by 2 U.S. re-refineries, one of which is owned by Safety-Kleen, with the remaining 800 million collected gallons being burned as fuel. The other 500 million gallons of used oil generated each year is not collected and often causes environmental damage to surface and ground waters.



Re-refining used oil helps reduce air pollution that might otherwise be created by the burning of used oil. Used oils are generally burned in units with no air pollution control equipment so that contaminants (metals, sulfur and ash) are released directly into the atmosphere. Re-refining captures the majority of these contaminants, preventing their release. Further, re-refining recovers a non-renewable natural resource by reducing reliance on additional virgin lube oil.

Safety-Kleen, and in fact the entire re-refining industry, has faced significant challenges in overcoming the stigma of poor product quality. This stigma was a hold-over from older lower-technology processes that were unable to respond to the changing nature of the contaminants and additive packages found in the modern lubricating oils. In 1974, there were over 150 companies in the U.S. recycling oil into various types of lubricating products. In 1996, there are now only 2 oil re-refineries in the U.S. producing lubricating base oils, primarily due to the substantial capital investment required to produce the current high-quality product.

A key step in developing the used oil product responsibility program has been gaining the trust and confidence of the consuming industries. This has taken significant time and effort working with and achieving the certifications of standards-setting organizations such as the ASTM and SAE. In addition, Safety-Kleen has worked closely with equipment manufacturers such as the railroads, automobile manufacturers, and hydraulics manufacturers to gain acceptance of the product for use in their equipment. These efforts have allowed the re-refined lube oil product to be accepted as equivalent to virgin products, plus it has begun to develop a market among the consuming public for a "green" motor oil.

Project Participants: Safety-Kleen Corp. has worked with many different groups to develop and implement this program. The company has worked diligently with many Federal Government organizations as part of the President's 1993 Executive Order on recycled products to increase the amount of recycled products used within the federal system. This includes a highly publicized event with the National Park Service on the Capital Mall on Earth Day, 1996, and a closed loop system with the U.S. Postal Service and several state and municipal governments. In addition, over 60,000 small businesses that generate used oil currently participate in the used oil collection program. Major lubricant organizations, specification writers and retail consumers of lubricating oil products have also played a significant role in making the re-refined oil the accepted and trusted product that it is today.

**Project Goals:** The primary goal of this project was to develop an economical oil collection and processing program that can generate revenues and profits for the company on an acceptable level. The program would build on the company's strengths in infrastructure and distributions systems. The program must also be able to service the country's vast number of small to medium sized businesses by providing a way to help them protect the environment in a cost efficient manner.

Creating markets and demand for the collection and re-refining program was another major goal of this effort. First, the fact that re-refined oils were equal to virgin lubricating oils must be established. Then, industrial, commercial, and retail customers must be convinced of the quality so that they will accept the re-refined product and have the opportunity to select it based on it's recycled content. Finally, the public must want to participate in the program by having their automobiles' oil changed at a facility that will have the used oil re-refined.

**Project Drivers:** Public and government attitudes towards recycling helped drive the development of this oil recycling program. The President's 1993 Executive Order for recycled products supported the development of demand within the Federal government that has increased the visibility of the re-refined product. The public's increasing belief in recycling non-renewable resources and supporting energy independence has also driven the demand for the "green" products and collection services.

Consumers on an industrial, commercial and retail level have also been instrumental in providing the opportunities for this program. Customers have expressed the need for a used oil collection program which they are confident will minimize their potential future CERCLA liabilities. Safety-Kleen has been able to meet this need through the financial stability and size of the company.

**Project Benefits:** The development of the closed loop oil collection and re-refining program has provided numerous benefits to the company and to our customers. Based on \$18 per barrel crude oil, production costs of a gallon of lube oil made from our re-refining process is 40% to 50% less expensive than production from virgin crude oil in a typical conventional lube refinery. It has also expanded customer acceptance of the quality and consistency of the lube products as shown by the increasing sales of "green" motor oils, such as Safety-Kleen's top-quality motor oil, America's Choice. Partnerships with major retailers such as Wal-Mart and Goodyear automotive centers have also increased the public's acceptance of and access to re-refined oil products.

The program also has significant benefits to the nation and society as a whole. Increasing public awareness of the convenience and availability of used oil collection programs lessens the impacts on surface and ground water due to improper disposal. It also reduces the country's dependence on foreign crude oil by not needing to create additional virgin lube oils, saving a valuable non-renewable resource. In addition, the relatively new re-refining technology eliminates the significant waste disposal volumes associated with the older re-refining technologies.

Project Obstacles/Barriers: Perceived quality issues of the re-refined product have been a significant obstacle to the development of markets for the re-refined oils. The perception of inferior quality was due to the out-dated stigma from uneven quality control in early oil recycling processes. This led to a lack of acceptance by equipment manufacturers in allowing the use of re-refined lube oils in their equipment without voiding the warranty. A great deal of work was done with these groups to overcome the resistance of specification writers to acknowledging the equivalency of the re-refined product to virgin lubricating stocks.

As much as the environmental movement has created opportunities for this program, sections of the RCRA regulations have also provided impediments to the development and expansion of the program. EPA's used oil regulations have incongruously placed burning of used oil on the same preference level as re-refining, contrary to EPA's Pollution Prevention Strategy and its waste minimization hierarchy.

### **Summary**

Providing our customers with the opportunity to participate in product take-back programs has been profitable - for the customers as well as Safety-Kleen. These programs encourage the conservation and reuse of non-renewable natural resources, provide generators with convenient options to improve the environment by managing wastes appropriately, and meet a growing demand for "green" products and services.

