INTRODUCTION

The metalworking fluid industry is a fragmented business using various competitive strategies to gain market share as described in "Metalworking Fluids—An Industry Analysis" published in Lubrication Engineering five years ago. This geographical analysis is an expansion of that research. The industry includes all compounders of cutting, grinding, drawing, and stamping fluids in the United States. The sources for a consensus of opinion were interviews with compounders' sales and technical representatives.

This analysis uncovers major issues confronting the metalworking fluids industry as a whole, and identifies the specific markets and trends affecting each geographical area.

Geographical Areas

The United States was divided into five areas: Northeast, Great Lakes, Central, South, and West, as shown in Fig. 1. The concentration of metalworking fluid users is shown in Fig. 2. The states with the most metalworking plants are New York, Ohio, Indiana, Michigan, Illinois, Texas, and California. The ready access to lakes and oceans for transportation of metal has led to this "Rust Belt" concentration.

Likewise the metalworking compounders are located in states where there is a majority of usage, see Fig. 3. Illinois, Michigan, Ohio, and California each have more than 20 compounders, with Indiana, Pennsylvania, New York, and New Jersey well covered with 10-20 compounders. The total of compounders known to the author is 328. This includes all companies manufacturing fluids regardless of their size. The distribution of this total is as follows:

- Northeast 68
- Great Lakes 115
- South 76
- Central 73
- West 41

Fig. 4 shows the compounder sales distribution comparison by area. By combining the estimated number of users at various volumes of fluids one sees a bell curve for each geographical area. Because the Great Lakes area has many large volume users, the area under the bell curve is high and wide. Most agree that the total of users in the Central area outnumbers the Great Lakes. However, the estimated sales dollar volume by area is shown in Fig. 5 as follows:

- Great Lakes 34 percent
- Central 23 percent
- South 18 percent
- West 13 percent
- Northeast 12 percent

It was found that the South region is growing at the expense of the other areas.

Product Types

As reported in the earlier analysis in 1984, the ratio of oil based products, i.e., straight oils and soluble oils to synthetics and semi-synthetics was 60/40 respectively. Now, in 1989 the ratio has increased to 68 percent/32 percent. The reason for this change is the lower cost of oil products and the increasing disposal costs making recyclable straight oils or easy to waste treat soluble oils preferred. Geographically, however, there are some variations in this ratio. In the Northeast and Central areas, a 60/40 ratio was estimated; in the Great Lakes and West an 80/20 ratio of oils to synthetics was cited; in the South, a 50/50 ratio is experienced by the compounders serving that area.

Incidentally, the areas using the most soluble oils are in the areas where hard water predominates. The Rust belt states have moderately hard water with Indiana having extremely hard water because of the limeous formations in the ground. California has little ground
Fluid Management Program

Another key automotive issue is the Fluid Management Program implemented at General Motors. They are a powerful buyer in the industry and, consequently, control of the fluid suppliers. The purpose of the program is to enable GM to compete with the Japanese by reducing the number of suppliers and minimizing the coolant used, which is typically a complex mixture of corrosion inhibitors and biocides.

In concept, there would be a single fluid supplier for each plant. The supplier would own the plant that manages the fluids. As a result, they are then compensated on a parts-produced basis. The supplier profits on the service he provides. The criteria for suppliers includes a tender process, price, and the ability to coordinate all chemicals in the plant. Therefore, a strict effect may occur with a supplier providing not only the metalworking fluids and lubricant in a single package, cleaning, and waste treatment chemicals. Very few suppliers are experienced in all these areas and this is where GM's contract to five suppliers comes to fill out the suppliers product offerings.

To date, there are five GM plants using the fluid management system, and this trade is worth millions of GM and chemical suppliers the same. Because there is much capital at risk in a system like this, the larger publicly held companies have won the contracts.

Waste Disposal

By far, the major issue confronting the entire industry is waste disposal of used coolants. In many areas it now the key criteria for fluid evaluation. Many plants have treatment facilities that are set up to handle only the water-based component. The actual automotive water-based coolant is a mixture of organic and inorganic chemicals. These products readily split with acid or polyelectrolytes. There is also a strong movement to develop chemical treatments that prevent the users from investing in a change in facilities. This situation has been driving increased acceptance of the use of the biodegradable liquid coolant base. Use disposal costs from $2.00 to $4.00 per gallon, and these costs are likely to increase. In a split coolant volume is much less cost- to dispose of concentrated fluid that the user is unable to use. Therefore, the compounds are aware of the chemical additives that are currently treated for a good BOD/COD ratio and a biocide. (Fats, Oil & Grease) is costing them 10 to 15 cents per pound. Sulfur Tita III is a new EPA regulation where all chemicals considered hazardous in a fluid must be identified on the blenders' MSDS. Many have not been able to fulfill all the requirements. These chemicals identified for waste disposal include glycol, ethylene oxide derivatives and dimethoxymethane, which is a major building block for metalworking fluids, the impact could be significant, depending on the reactions of the compound's customer.

The late 90s promise some significant improvement in the area of disposal becomes. It is difficult for the compounds to develop one fluid that gives optimal disposability because of the various disposal systems.

Disposal & Regulation Concerns By Area

In the rigid state regulations. New Jersey was the forerunner of the Right-to-Know laws. Massachusetts, New Jersey, and Pennsylvania have the strictest rules in the Northeast due mainly to the increased concentration of chemical manufacturers there. Effective in January of 1989, Pennsylvania requires that major categories of chemicals be listed on the top five ingredients on their drum labels. Between this and the MSDS, the identity of the "trade secrets" is no longer a mystery.

In the Midwest and South, the major concern is the concentration of chemical manufacturers. Much of the acquisition has been by foreign investors including the British, Germans, Italians, and Japanese. A main reason for this is the lower overall cost of disposal. One recent trend in the region should be observed. The EPA guidelines on trade secrets states that any chemical that can be reverse engineered is not considered a trade secret. The cradle- to-grave concept is disappearing and often in this area where the ultimate responsibility of disposal of chemicals carries on even after disposal of the product by the user. The cost of disposal could be significant.

In the Central states, the disposal issue has been a driving force to the back interconnection (i.e. making their own fluids) with some major agricultural inorganic recycle in the plant coupled with basic additives made usable lubricants in the plants. The rating on the U.S. dollar in the nature of recycled and waste oil could greatly impact this practice.

In the South, the high water table in the Carolinas reduces their desire for soluble oils. The smaller compounds have been biodegradable synths with good BOD/COD ratios are more popular.

By far the area most affected by state regulations is the West. California's OSHA has highly regulated requirements. The Clean Water Act of 1972, which expanded 300 chemicals to be cancer causing that includes ethylene oxide and lube oils. They are classified as the same lead and chromium. The public is not notified of these chemicals in bio-based fluids and gas stations have signs notifying customers of the potential hazards of personal exposure.

The real choice for the users in California is to waste the fluids or recycle. Only the larger users have treatment facilities, so the smaller users are driven to straight oils. There is no such thing as "biodegradable" fluids in the West. Nothing can be sent to the sewers there. It is easier to dispose of oil than water.

There can be no liquid hazardous waste so the volume of waste grows dramatically with absorbents. The one-inch rule is in effect here where any drum with less than one inch of chemical is considered empty. The one-inch rule is in effect here where any drum with less than one inch of chemical is considered empty. No single issue has affected the industry more than that of chemical waste disposal.

Market Decline

Most all compounds interviewed feel that the low oil usage and fluid consumption is declining. Estimates ranged from -5 percent to +2 percent change per year, with the GNP running +4-5, this range is considered a slow down.

One of the reasons for that decline is the conservation of fluids, because of the high disposal costs mentioned earlier and more efficient systems like flexible machining centers. Manufacturers are also running at a higher throughput rate making more parts with the same coolants.

Some of the fluid demand is moving out of the U.S. to Mexico, Thailand, Brazil and the Orient. Another reason for decreased consumption is that the amount of metal in cars is decreasing. It is being replaced with plastics, ceramics, and composite materials. There have been many die-castings in the automotive, steel and agricultural implement sectors that have decreased the total consumption. The Japanese entering the U.S. and producing products here may help to reduce the downward trend, but many cite that the Japanese are using fluids from Japanese suppliers.

Acquisition

In the past several years, there has been a flurry of acquisitions of metalworking compounds and their additive suppliers. This has occurred as companies have been concentrating on large entities. This occurrence is very common in mature industries such as this one. It is similar to the auto industry where initially there were many manufacturers who were essentially only the major producers. Much of the acquisition has been by foreign investors including the British, Germans, Italians, and Japanese. A main reason for this is the lower overall cost of disposal. One recent trend in the area should be observed. The EPA guidelines on trade secrets states that any chemical that can be reverse engineered is not considered a trade secret. The cradle- to-grave concept is disappearing and often in this area where the ultimate responsibility of disposal of chemicals carries on even after disposal of the product by the user. The cost of disposal could be significant.

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Sources

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acquired firm. Whereas, in Europe, what you do with the company including its production and personnel is controlled.

Most agree acquisition is the best way to gain market share in a mature declining market. Some acquisitions expanded the geographical coverage of a compounder giving it a West or East coast facility to better serve its customers. California’s building permit restrictions make acquiring an existing facility with approved sewage lines appealing.

Another result of an acquisition is the possibility of increased profits through consolidation of like services in the merging business units. The incentive in government regulation requirements is also convincing smaller compounders to sell their operations to firms large enough to handle the consuming paperwork.

The compounders interviewed believe the consolidation will continue. Some predict that the resulting companies will be more powerful units; others suggest mismanagement will result unless a well orchestrated integration is completed.

Trends

The metalworking fluid consumption is moving to the South and overseas. As a result, many compounders are finding themselves competing in a global market with new issues and problems confronting them. In addition, warehouses and facilities in the South are opening to better serve the needs of those customers.

There is a perceived decline in new technology in the industry. This is due in part to the maturity of the market. Other causes are the regulation and registration requirements for new chemical additives, and the ease of reverse engineering by one’s competitors.

Pre-bake is becoming a reality. No longer are industry participants questioning the viability of such a program. They are now discussing the hurdles to overcome. The concept of a rust preventative coating for coated steel with the drawing lubricants included would reduce the need for repainting a lubricant when forming parts. Variations in the metal quality and composition from shipment to shipment makes performance requirements a challenge to compounders.

Statistical Process control is a trend that is effecting everyone. This means of better quality control reduces the concern of quality of incoming raw materials and from the user’s perspective-accepting metalworking fluids. These quality specification limits and process control systems are periodically audited by the user to ensure compliance.

Several compounders strive to develop a bioreistant or biostatic fluid so it will have longer tank life, thus reducing disposal frequency.

The downside to this concept is that these bioreistant fluids may also be waste treatable, often two mutually exclusive parameters.

Needs

To meet the changing needs of our customers, the compounders are in pursuit of additives that address these issues. Of primary importance are waste treatable additives with some relative hard water stability and bioreistance to extend the fluid’s usable life. To address the increasing prices and regulation on additives based on ethylene, compounders are looking for replacements. For water dilutable draw and stamp compounds, the compounders need galvanised metal tank inhibitors for the automotive body parts.

Looking to future regulation concerns, the compounders continue to look for chlorinated penstil replacements. These are still widely used in the industry because of their extreme pressure lubrication properties. A significant need for the pre-bake program is lubricant additives that will leave a uniform, non-staining dry film.

Conclusion

The metalworking fluid industry faces similar issues in all parts of the United States including waste disposal, regulation, performance requirements, acquisition, and market decline. There are variations on this theme in each area of the United States. Knowing this and understanding the unique features and needs of each area can guide the compounder in forming their research, sales and marketing plans for each market segment.