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Market Study: High Pressure Cable Fluid Applications

Interviewed: General Cable, S. Turner, 11/3/70
Phelps Dodge, J. Moran, 11/16/70
Okonite, R. Waldron, 11/4/70
Anaconda, E. Eich, 12/4/70

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SECTION A

SUMMARY

I. The Market - 3 million gallons in 1971

All companies interviewed agree that the demand for fluid filled cable is increasing at a greater rate than expected. Anaconda reports that an anticipated 25% annual increase in pipe cable demand is running at 45% actual. At the present rate they question the ability of the industry to produce the cable. They foresee 3 MM gallons fill next year. About 90% will be static (insulating only) and 10% mechanical fluid (insulating and cooling). It is expected that in ten years the 90-10 ratio will be reversed. Generally speaking, the present demand for static fluid is satisfied with mineral oils and the demand for cooling fluids with polybutenes.

II. The Price - \$.50/gallon and \$.85/gallon

The selling price for the static fluids is quite firm at \$.50/gallon. Upgrading the fluid by vacuum treating at the refinery adds \$.10/gallon. Upgrading the fluid by treating at the cable manufacturers plant adds as much as \$.30/gallon for rehandling. Anaconda does this and resells the fluid at \$.80/gallon as part of their overall package; i.e. cable, fluid, installation and start up. It is generally agreed that a cooling fluid can sell for more if it can do more in saving on pump size, power input and heat exchange surface. There is a strong respect for heat transfer ability. A temperature drop as low as 10°F reflects an enormous increase in cable power carrying capacity. Given the right product, carefully marketed to feature heat transfer related savings, will result in a credible price structure.

III. The Specifying Influence

The cable companies feel strongly that they determine the product. There have been some independent purchases, in the past, by Utility companies such as Boston Edison, Consolidated Edison, Pacific Gas & Electric, Commonwealth Edison and Florida Light, but these are considered isolated incidents in which the cable companies have at least expressed advisory influence.

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IV. The Product

Would have to be compatible with mineral oils and polybutenes now being used as impregnants. Following in importance is low power factor, high insulating quality and low viscosity. Assuming that any Monsanto candidate fluid will be similar to polybutene in these properties, our greatest area of acceptance would be gained in furnishing a product of the highest priority. The product should be exceptionally dry, without traces of gas, shipped in clean tank cars under an inert blanket. A very low viscosity product would be attractive, but not so low that it might absorb gas in shipment or cause inordinate pump wear in the system. Thermal stability is required in the range of 75°C to 125°C.

V. Attitude Toward New Source

Generally, a welcoming attitude. The cable manufacturers have expressed a genuine interest in a Monsanto offering. The only exception was Okonite. The interview at Okonite did not arouse the interest expressed by the others. However, this is partly explained by the forthcoming (eight months) retirement of Dick Waldron and the fact that the company was recently sold to Ling Temco Vought, a somewhat confused business atmosphere at the moment. Of the many suppliers who have made offerings to this market only a few have retained the respect of the cable manufacturers. Sun, American and Cosden seem to be fairly steadfast suppliers. Others, like Standard Oil and Chevron, have marketed fluid and then withdrawn it when the market was stronger elsewhere. Witco produces an attractive brochure, enclosed, but has not demonstrated serious intentions to supply fluid on a "service" basis. Anaconda claims that they have actually campaigned with polybutene suppliers to raise the price in order to assure their presence in the market.

VI. The Testing Program

All, with the exception of Okonite, are willing to investigate our fluid candidates. They would expect us to submit the fluid with a reasonable amount of data: specific gravity, viscosity, specific heat, power factor, etc. It would be preferable if we drew data comparison against existing standards such as mineral oil and polybutene. Our effort should be in the direction of a high purity degassed sample. Phelps Dodge recalls looking at a Monsanto product in the past, about six years ago. They recall it as a dodecyl or tridecyl product but cannot recall any other specific details. Other test programs are under way.

Phelps Dodge is working with General Electric on cryogenic cooling. Anaconda is active with Philadelphia Electric Co. on finding physical improvements (better baffling, higher fluid velocities) to an existing test loop. Linde Division is working on gas cooled cables.

VII. Conclusion

The need for cooling fluids and systems is urgent. Many efforts are under way; Consolidated Edison has an oil to air system and an oil to water system in operation. There are several systems in operation utilizing mechanical chillers. New efforts are under way involving fluids and cryogenics. Our franchise in electrical fluid technology and in heat transfer fluids places us in a unique marketing position. This, coupled with the need for a reliable source, should make any effort in developing this market for Monsanto reasonably sure of success.

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SECTION B

INTERVIEW SUMMARY - INDIVIDUAL COMMENTS AND OPINIONS

I. Fluids Used for Impregnating and Filling

General Cable:

Impregnate with a viscous grade of polybutene, more viscous than generally used for cable filling. Has in plant storage system 200,000 gallon supply. Fill cables with Sun #6, Cosden 015SH, American 15H, Mobilect A. Have had experience with gas cooling, N₂ and SF₆. Prefer to fill with oil.

Phelps Dodge:

Impregnate with parafinic based Sun oil. Use polyisobutylene with gas cooled cables. Fill with mineral oils, Sun and Witco Golden Bear. Also, Amoco and Cosden polybutenes.

Anaconda:

Impregnate with naphthanic based Sun oil. Fill with Sun 6 and American polybutene.

Okonite:

Impregnate with heavy grade, 15H, polybutene. Fill with Sun 6, American and Cosden polybutenes. Fill low pressure cable with Mobilect A, substitute alkyl benzene in Europe.

II. Fluid Specifications - Order of Importance

All require compatibility with impregnating fluid.

General Cable:

1. Low power factor < .005 aged to .01
2. Low viscosity, lower than Mobilect A
3. Good dielectric, 35KV
4. Pure product - no additives or stabilizers
5. No entrapped gas that would escape under electrical or thermal stress

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Phelps Dodge:

1. Low viscosity, 50 SSU at 100°
2. Low power factor, .005 acceptable
3. High purity and stability
4. Good dielectric
5. Reasonable boil point, they vacuum treat fluid before fill
6. Low pour point < -25°F

Anaconda:

1. High purity, oxidative stability, no particulate matter, no acid or other chemical contaminants
2. Low power factor
3. Good dielectric
4. Good thermal stability at 125°C

Okonite:

1. Price
2. Low viscosity
3. Low power factor
4. Good dielectric

III. Fluid Testing Specifications

All companies, except Okonite, have expressed a willingness to test Monsanto fluid. Okonite would prefer to do so upon request from a utility customer. ASTM procedures prevail.

<i>Acid</i>	
✓ Gravity API	D-287
✓ Specific Gravity	D-1298
✓ Flash Point	D-92
✓ Viscosity	D-445-446
✓ Pour Point	D-97
✓ Color	D-1500
✓ Dielectric	D-877
✓ Sulfur	D-989, - 129
✓ Neutralization	D-974
Water Content	D-1533
✓ Inorganic Chlorides	D-878 -
✓ Power Factor	D-924
Resistivity	D-1169

IV. Awareness of Alkyl Benzenes

General Cable:

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Not familiar.

Phelps Dodge:

Aware of use in Europe. Investigated a Monsanto fluid, dodecyl or tridecyl, about six years ago. Rejected it for use, but cannot recall fluid specs or rejection reasons.

Anaconda:

Used 5% to 10% added as a viscosity modifier. Aware of use in Europe in low pressure cables.

Okonite:

Aware of alkyl benzene. Use in place of Mobilect A in European low pressure lead sheath cables.

V. Commentary on Selling Price as Related Fluid Advantages

General Cable:

Static fill, insulating only, just be at approximately \$.50 per gallon. Fluid used for heat transfer fill can be as high as \$1.00 per gallon provided there are system benefits, i.e. pump savings, surface savings, etc.

Phelps Dodge:

Static fill should be \$.50/gal. for vacuum treatment at refinery, believe it is worth \$.05/gal. Treatment consists of vacuum distillation for water and gas removal. At 1.0 mm HG.

Anaconda:

Static oil should be at \$.56/gal. Could get more for super clean. They buy and treat at Hastings plant. Resell at \$.80/gal. Bury price in overall contract to sell and install cable.

Okonite:

Only one of four that would not specify a higher priced product.

VI. Evaluation of Present Sources

General Cable:

Sun Oil and Cosden, major suppliers. No availability problems. Many quality problems.

Phelps Dodge:

Sun, Cosden, American. No supply problem. Dissatisfied with purity.

Anaconda:

Expresses more concern than any other manufacturer over supply and purity problem. Sun and Cosden major sources.

Okonite:

No real problems in availability or quality.