J.J. Roder - Chicago

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Commonwealth Edison Co.
Pipe Type Transmission Cable

J.R. Fallon
St. Louis

J.S. Pullman - New York
R.F. Irwin - Houston
D.E. Roush - DROUS
J.G. Bryant - JBRYA
M,F. Baber - MBABE
R. Davis - RDAVI

Further to my call report of 9/25/70 regarding Therminol 55 potential in the cooling of underground electrical cable.

Potential

Commonwealth Edison estimates that they will lay about 70 miles of pipe type cable in the next four to five years which is about 700,000 gallons of fluid. Other electric companies who are very actively involved with these systems are:

Public Service of New Jersey
Philadelphia Electric
Consolidated Edison, New York
Boston Edison
Detroit Edison
Florida Light & Power
Florida Power Corporation
Memphis Light & Power
South California Edison
Pacific Gas & Electric

There are many more I am sure but the Commonwealth Edison people estimated that on the average these companies would install an equivalent amount. I suspect that all electric companies would have some potential because in most major cities right of ways are difficult to obtain for above ground transmission lines.

Competitors

There are basically two fluid competitors now although according to cable suppliers many different fluids are tested periodically.

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Polybutene - two grades of polybutene are sold. High viscosity polybutene is widely used to impregnate the cable insulation before shipment. Low viscosity polybutene is widely used to fill (or pressurize) the pipe type transmission line for cooling. The best estimate of selling price is about $.55 to $.65 per gallon. Two suppliers are Cosden Oil and Standard Oil. Major use of polybutene is as a motor oil additive.

Mineral Oil - inferior to polybutene however it was the first product used and has carried over into some of the newer systems. Supposedly it is compatible with the polybutenes in that a cable impregnated with polybutene could use mineral oil as the pressurizing fluid. No specific data on the fluid but it is called Sun Oil #6. I am guessing but I suspect the cost is in the area of $.20 per gallon.

Disadvantage/Advantage

The major disadvantage to the underground cable system is the cost which is about 25:1 as compared to above ground cable system. The cost of underground pipe type cable will run between $500,000 - $750,000 per mile installed.

Alternates to the liquid filled systems are also being studied but at the present time there are few good alternates. The EEI (Edison Electric Institute) spent 5 years at the Armour Institute doing research on polymers, polymer films and polymer papers, etc. without too much success. Copy of that report has apparently been sent to Mike Baber for review.

The advantage of this liquid system is that the cable size can be greatly reduced by cooling. Twice the amperage can be passed through a cooled cable.

Specifications

Specifications for pipe type cable and impregnating and pressurizing fluids are maintained and made available to the industry through AEIC:

Association of Edison Illuminating Company
51 East 42nd Street
New York, New York 10017

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To the best of my knowledge the cross section of a typical cable would be as follows: (from the center out)

1. copper cable
2. wood pulp paper insulation
3. fluid impregnation
4. polyethylene or mylar wrapping
5. copper or more recently a better zinc metallic tape outer wrap.

Cooling fluid in a typical filled system would enter at about 68°F. and leave at about 140°F. The paper insulation should always be maintained at temperatures less than 185°F. to prevent charring and failure of the cable.

Most cable after impregnated with fluid is stored and shipped under nitrogen blanket until it is used to prevent moisture contamination. Some cable made in Japan is sealed in a "coffee can" under 2 psi pressure to eliminate moisture contamination.

Key Influences

Key influences in obtaining business are the cable manufacturers, and electric companies with a slight mention of the AEIC which is composed of member companies.

The cable companies are most important because they do most of the testing of new products. A better heat transfer fluid could give them a competitive edge by allowing them to carry more amperage in a smaller cable. The smaller the cable, the smaller the pipe with a reduced amount of cooling fluid.

The electric companies do a small amount of testing and a new and better product could greatly reduce their installation costs.

The AEIC passes along all new ideas and innovations to their member companies and is important from the standpoint that they write the final specifications for cable and cooling fluid. This allows all competing companies to bid against the same specification yet it allows the AEIC to incorporate improvements.

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Cable Companies

General Cable Company
New York, New York
Steve Turner
(212) YO6-3800
Testing Laboratory-Bayonne, New Jersey
Chicago Contact - Phil Wansik (299-1161)

Phelps- Dodge
Yonkers, New York
Jim Moran or Edwin Merrell
(914) 963-8200
Chicago Contact - Dwight Palmer (282-8585)

The Okonite Company
Ramsay, New Jersey (Engineering Headquarters)
Richard Waldron
Cable mfgr. location, Patterson, New Jersey
Chicago Contact - Tom Spriggs (352-7200)
(Okonite is one of the big boosters of polybutene)

Anaconda Wire & Cable
River Street.
Hastings on the Hudson, New York
Edward Eich - Chief Engineer
(914) GR8-1500
Al Kane - Customer Service
Chicago Contact - Hank Johnson or Henry Kenny (FR2-5200)

(Anaconda along with a Japanese company are participating on the recent Commonwealth Edison order. Anaconda will supply the impregnated cable; they will buy the pipe from Republic Steel and have a mastic coating applied to the pipe before shipping to Commonwealth Edison. The cooling fluid will be purchased by Commonwealth.)

The Japanese cable company is either Hitachi, New York City or is represented by Hitachi in NYC. No names available.

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Electric Companies

Commonwealth Edison Company
Maywood, Illinois (312-531-5253)
J. L. Williams - Trans. Engr. Department
A. Zanona - "
E. H. Grosser, Jr. "
Bob Nease "

AEIC

A. Zanona of Commonwealth Edison is chairman of a committee which writes the specifications for cables and fluids.

Action Required:

1. Contact AEIC to obtain specifications for fluids.

2. Contact cable companies to determine possible tests with our fluids.

3. Send 5 gallon sample to A. Zanona at Commonwealth to run aging tests.

Other Associated Potentials

1. Impregnating fluids sold directly to the cable companies.

2. Fluids for self contained cables or as they are sometimes called "low pressure oil filled cables." Not a large volume of fluid used here but a transformer type oil is used. Europe uses almost all self contained cables in 69 KV and larger transmission cable.

   Perille Company, Milano, Italy, has supplied a 12 mile installation from Connecticut into Long Island. Cable was filled with dodecylbenzene.

   One trade name for the fluid used in the self contained cable is called # 5314 Mobilect A.

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Miscellaneous

Possible contacts at Chicago sales offices for polybutene suppliers:

Cosden - Steve
Bob Dwyer (Texas)

American Oil - Irving Lanier

Was also rumored that American was not able to bid the 150,000 gallon system for Commonwealth because of supply problem.

Specification on low viscosity pressurizing polybutene:

Viscosity	
100°F.	115-140 SSU (24-30 cs)
212°F.	38-44 SSU (3.5-5.5 cs)
Power Factor	0.1% at 212°F.
Dielectric Strength	35 KV or higher (ASTM Des. D877)
Specific Heat	.55 at °F.
Pour Point	-45°F.
Flash Point	300°F.

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