

Phone Meeting
High Voltage U.G. Cables
John Engelhardt
Anaconda Wire & Cables.
914-478-1500

6/4/70

Plastic film replace paper
interesting idea
Problems - subtle

Synthetic cables not good so far
because of mfg. cap.

They work with Dupont on gas & lig
Freons.

Replace N_2 with gas Freon

Worked on gas insul cables.

They out

ITE sold gas filled cable

High Voltage Engineering also
will sell

Anax -

Pursue synthetic

Wanted to submit film cable to
Watts mill.

Other 4 submit paper impreg cable
for high voltage.

looked at polycarbonate +
polysulfone - not get much.

FC-75 by 3M.

Testing 2 problems

- (1) Find application
- (2) Get utility to buy

High Pressure oil ~~filled~~ filled
pipe type cable

Gaseous has great future
Better than oil - ~~paper~~

Spacer gas cable

Conductor supported by spacer
Epoxy dies usually.

Some - spirally wound filament of
PE or PStyrene.

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CATV - Foam filled PS.

ITE +

HV Surge offer ^{SF₆} ~~DS₆~~ gas
that compete with

Support

Gas high dielectric strength under pressure, low DC, zero loss.

500 KV dielectric loss can be substantial

Problem is to sell the utility
Difficult to get new concept in.

He there 4-5 yrs. Problem 4 times already.

10 yrs from conception to compl.

Research on cryogenic cables. Not see future. Economically too high.

Playing with fluids -

Min oils

Polybutenes being tried

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Forced cooling being used

Heat Transfer Prop.

Need thinner fluids.

High dielectric strength
Low dielectric loss (Dissipation factor)
Low dielectric constant

Good heat transfer properties

oil - paper
diss factor 0.1% - 0.2%

Good PE PF 0.05%. Small PF.

Above 0.2% PF out of picture.
Below look at.

Don't see Solid at 345 or 500 kV.
Problem is rfg. techniques.
Dielectric also a problem.

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PE wall thickness twice oil/paper
cable wall thickness at 138 KV
at Waf. Mill.
Same size as 500 KV Paper cables.

Mfg tech problems
Con. & extrude perfectly
Get crop & voids in & so not
get inherent strength of PE.

PE 10 x inherent strength of oil/paper.
PE more sensitive to corona.

Bad experience with PE lately.

Problem to sell PE solid above
138 (until).

Synthetic tape tried & looks good but
~~no~~ have problems on testing.

Ed Eick - his boss.

look for in film.

High D. Str.

low loss.

Compat w oils & gases.

Film wrapped on layer by layer
open butt ~~seams~~
so you bend cable.

Mech properties (bending, etc)
most important problems.

Tried embossing tapes. Reduce
friction. Tried impregnants.
Got one dying to try.

↖ Paper/film laminate solves
many problems.

Sandwich being tried
Film ~~paper~~ - Film

If cheaper

$\$/\text{MVA}$ capacity the thing.
How much V

Min oil/paper will be acceptable
at 500 KV. Cost would be
incentive to replace.

oil/paper
Good

Drawlocks

Must be careful during r/g
& installation.

Must get water out.

High voltages have to be topped
in controlled atm to keep H₂O
down.

One reason need pressurized sys
to

25-30,000 press system on line to
keep press on.

Expensive to put in ground
Can reg'd.

Synthetic film - not suscept to
H₂O could knock down

Requirements of - - - - .

Oil must be insensitive also,

Plus

Higher dielectric & reduce amt
of insul mat-ls.

Decrease thickness makes better
capacitor.

W bot about 10-15 mi long
can't have much cap. but
most 5 miles long at longest.

Good

Make cable cheaper.

less sens to temp cond.

Less paper

Reduce size of pipe

Red weld & inst cost

Red amt of mat. C to fill pipe.

M in oil OK on synth film

but tending to Polybutene

PB - more freedom in viscosity

use diff cut + get lower vis.

Better than Polybutene
Cheaper ST answer

Prop Inst

P. Factor

Diel St.

Diss factor

Fluids - ^{there is} no application for fluid
more expensive than polybut

2 Fluid of fluid

Press mech

Heat Transfer mech.

If fluid OK or passing med. +
for better heat transfer choose
than PB then maybe OK.

P Bover Min oil

1/2 oil is PB + 1/2 Min oil
all pipe type cables.

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oils almost perfectly clean
Very stable.

These oils cleaner & better &
more stable & higher vis than
Texas oils, but vis down.
No reason in past not to have high.
Now want to move.

Sun oil Co.

Sun - only prod of Min oil

American - main prod of PB

2 others?

Cal?

Real reason like ^{poly butene} PB - not
have to factory treat. All these oils
have to be treated.

Can't get from American direct

Treating - clay filter
slab & costly process.

4 Cable Mfgs
230 K V x above
oil - paper

Obavate
Phelps Dodge
Gen Cable
Anacanda

Know what all working on.
Patent game.

Initially better to work with
one co. Expensive testing & exp
need to be done.

Phelps Dodge built lab -
will test anything for anyone.

ERC, Research Council.
Elec. Research. Council
formed.

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Best person

Ed Eick the man to talk to.
Expert on oils & additives.
in Anaconda.

Dr. Waldron

Chief Eng. at Okanite

Fells Anaconda head & shoulders
head & sh above on
Synthetic table.
Ed Eick most for out man in
industry.

Others not so much so.

Dupont active on res. Much on
Freon products.

Been on & off with suppliers
of films. Some gotten from 3M.
3M pretty active in research
in area.

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May be low volume.
unless replace paper.

Volume

Look at Elec. World Survey
No of pipe cables, etc.
Section cable.

No miles at v level
Miles in already

138

345

500

IEEE Trans on Power Syst & Sys.
Dig out Papers on UG Cables.

Get copy of AIEE/IEEE
Power Cable Capacity Tables,
Gives cable constants
How much oil, etc.

Power Cable Capacities

Vol I

Publ. AIEE (now IEEE)

Power Cable Cap.

Int. reg. Cable Ins.*

Pub. No.

IPCEA P-48-426

283 Valley Rd

Montclair, N.J. 07042

\$4.54/cy in 1968.

IEEE Transactions Paper - Read

The Role of the Transp. Res. & Load Capability
of Cable Systems

J. H. Nether

M. H. McGrath

AIEE Trans., Part 3 (3rd

Power App. & Sys.

Vol 76 (Bound)

Oct 1957, p 752-772

Things not change since then.
The Bible

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Local Utility

Underground Systems Reference Book
1957.

E.E.I.

Pub 55-16.

Europe - behind the U.S.

• Rely on low x med pressure
self contained cables.

Aurocoudex pretty closely tied to
Pirelli. * Pirelli went to Bergen for cables.

No Mkt. Res. on Cable Industry
+ Need.

\$ Volume of EHV small.

Interesting films. like to look
at. Mech Prop.
Elongation, etc.

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