1962

REVIEW OF TRANSFORMER ASKAREL
July 1962

July, when most of our customers are down for vacations, gives us time to review our status and further consider future requirements.

To get things in proper perspective, history shows that transformer askarel enjoyed a peak in 1956 when 23.5 million pounds, of ready to use fluid, were employed. Indeed, 1956 and 1957 were the lush sales years for all electrical apparatus in this country. Sales, prices and profits were historically high and the big complaint was that Swiss, British and other foreigners were starting invasion of the American electrical apparatus boom, by offering much lower prices.

This created intense price wars to be followed by the "price fixing era" which in turn got "fixed" by our Government's actions.

Along this rocky way, things in the transformer industry, and especially power transformers, worsened rapidly during 1959, 60 and 61. Few if any of the "experts", and especially not those who in planning ahead had greatly over-sold management on constructing larger production facilities, predicted this decline nor cared to acknowledge it -- until it became obvious that the over-all transformer business had become as bad as in the early 1930 depression days.

During these 1930 depression days, transformer askarel was introduced as a new specialty which owed its existence solely to safety features. Fortunately, transformer askarel, being strictly a specialty, has been relatively free from the strong economic fluctuations prevalent in the over-all transformer markets.

Accordingly, while 1956 was also a peak for transformer askarel, its subsequent fall was less severe, as indicated by consumption of 20.6, 14.5, 15.6, 17.3 and 14.4 million pounds in the subsequent years. As it is indicated that 1962 is running along at an annual rate close to 15 million pounds, our sales have held steady over the past 5 years.

It has not appeared entirely logical to make a direct comparison of askarel against the general transformer market happenings, when askarel is not likely to ever command over 3 to 4% of the power and distribution transformer business.

Yet, as askarel is used for power distribution, it seems reasonable to feel that the recent strong depression in the electrical apparatus industry probably had at least some adverse effect on the demand for our material.

What we don't know is how much this general economic factor accounts for the drop from the 1956 to 1957 peak or what portion is due to "other reasons"?

While we can't change the general economy, we have schooled ourselves in the area of the "other possible reasons" and have been taking active steps to improve our position.

We believe that significant things in this area of "possible reasons" include the following specific factors, other than just to say that transformer askarel is not the most sought after item:

1. Since expiration of G.E.'s use patents and royalties in 1954 - 55, we feel that G.E. has not pushed their Pyranol transformers as strongly.

2. However, all transformer makers prefer to manufacture mineral oil or dry type units rather than askarel.

3. Also there is tendency on the part of transformer users to avoid a liquid and prefer a dry transformer, especially when the liquid involves the toxicology of askarel. There is fear about its maintenance and handling. The odor is strong, the vapors irritate, the man who got askarel in his eye felt its sting and some who dipped their bare arms into it got a rash.

4. Notwithstanding the excellent promotional job done by G.E. or the capability of Westinghouse and others to remove the mystery of askarel behavior, as compared with the familiar properties of mineral oil, -- these people really never explained these facts to gain maximum user confidence and understanding of askarel, over the 30 years since its introduction.

5. Tied to this we know that often the simplicity of askarel transformer maintenance has not been presented adequately by especially the smaller manufacturers.

6. Consequently there is much confusion and alarm about the high power factor and relatively low resistivity of askarel transformers. While this is typical of askarel -- yet in absence of adequate explanation, users who observe it wonder if it will cause the transformer to explode!

The foregoing are included in the list of "reasons" about which we are taking active steps. But these are all incidentals, objections

that could promptly dry on the vine and we would have indeed a bonanza on hand instead of a specialty -- except for the following primary problem:

It has not been possible to guarantee askarel against primary explosion!

While askarel guarantees against fire and secondary explosion (combustion of arc formed gas), primary explosion can and has occurred. This leaves open the thinking by some experts that if one can have a primary explosion -- why worry about a secondary boom -- and after all most mineral oil explosions have not resulted in serious fires.

Although askarel failure thru the years is less than 0.5% (a better record than mineral oil), the few explosions with it cost us heavily, because askarel has safety as its prime reason for being.

The few explosions have lead to directives at Consolidated Edison and elsewhere, including Monsanto, "that askarel shall be used only when essential", or "that mineral oil construction shall be used except where its cost becomes excessive", (i.e., the cost of fire protecting devices for oil - as after all mineral oil costs only 40¢/gal. vs over $2.00 for askarel).

It would be nonsense and wishful thinking on our part to quarrel with these sound proclamations. They do not rule out use of askarel where our product properly belongs! For example, in our own yard, mineral oil is not replacing askarel (although this was considered) for the two large units that blew recently. Moreover askarel, right now, is replacing three mineral oil units at the Queeny Plant because safe use of mineral oil would lead to higher cost. Also, sound judgement dictates that about 12 askarel units are going in at Chocolate Bayou for safety reasons, although at spots where this is not essential, over twice as many mineral units are going in. Likewise, the over one hundred thousand askarel units in over-all use are employed because thorough thinking dictated their selection -- not withstanding the fore mentioned proclamations which sound so favorable for mineral oil.

The first step in solving a problem is to recognize it and we clearly state that transformer askarel's fundamental problem is the possibility for primary explosion.

We have probed the past for the reason for each of the few askarel explosions that occurred under what was considered normal operation --

obviously not the failures due to lightening or accidental high impulse, back surge due to a system fault, or when undergoing experimental impulse testing.

This study convinces us that most of the (few) explosions could have been avoided!

Just to pick one example and because it is right here at home, the blow that occurred in our yard at Queeny Plant could have been prevented. The only excuse for it is that the transformer technology of the given vintage did not offer the modern approach now available for keeping water out. The amount of water that entered would have failed mineral oil or most any electrical apparatus.

Over the past few years, decided improvement has come about for askarel construction and the word "modernized" carries significant meaning vs. the early practices!

On looking back on the earlier technology of askarel transformer construction, one can find reason to feel that its automatic guarantees against fire and explosion of arc formed gas, which are provided by even the poorest construction, tended toward laxness in striving for the optimum design, essential to minimize primary explosion!

The design improvements in recent years have been accomplished mainly by G.E., Westinghouse, AC, i.e., the larger manufacturers. The smaller people tend to follow and often not too well.

A good recent example is smaller manufacturer in Canada who underbid G.E. and Westinghouse to get eight askarel transformer orders from the steel industry in Canada. This transformer maker was not properly versed on askarel technology, nor adequately equipped to make these transformers. The steel people noted the discrepancies and ordered askarel taken out and replaced with mineral oil unless Monsanto sent someone to Canada to rectify this situation, which was done.

Such effort in the area of askarel transformer technology is the only meaningful approach to handling its fundamental problems. Merely to advertise that our askarel is guaranteed to meet exacting specifications (which everyone expects to begin with) does little good toward increasing our market, if this guaranteed fluid is allowed in apparatus not capable of using it properly.

About a year ago, both G.E. and Westinghouse turned over to Monsanto, full responsibility for all commercial handling of transformer askarel. This does not mean that they expect us to stick our nose into their askarel transformers, but it does tell everyone that they will no longer hold the umbrella over their competitors. These folk then have turned to us for help. This has opened the door for us to do many more things than previously.

Along these lines, our objectives have been in the area of proper askarel transformer design, including proper construction, proper selection of materials of construction and of great importance, proper sealing out moisture which is the worst enemy of any electrical apparatus. An equally important phase is to provide simple and understandable maintenance guidance so that the user is able to carry it out and that his results will be capable of detecting trends to serve as warning of possible trouble ahead.

Even when given this, many will want someone else to do it. Therefore, Monsanto needs to offer such service testing and charge fully in line with similar arrangements at G.E. and Westinghouse, as we are not interested in putting their service out of business.

Our objective is to take care of the needs of the smaller transformer makers and all their customers, who sit out on a limb, as G.E. no longer helps them since G.E.'s Pyranol use patents and royalties expired.

In addition to supplying the maintenance guide, and doing the other above things, the time has now arrived for Monsanto's need to actively advertise transformer askarel. Several such ads are being considered. Also, I am publishing a technical paper in Insulation Magazine (the best trade journal for this purpose) to clarify mystery about askarel.

We have also intensified our direct contacts with askarel transformer users. A prime reason why I am active at ASTM, AIEE, The National Research Council's Insulation Conference, The Electro Chemical Society and The Insulation Conference, is that at these various meetings, it is easy to live several days each year with the head electrical engineers of leading utilities, as well as others, to learn their latest thinking about transformer askarel. I know of none, using askarel, who claim dissatisfaction with its performance. Nor can I find anyone who has a general policy about "throwing it out". As this seems to disagree with a survey by John Harris in 1956, we ask the reader to study the attached tabulation which gives the facts as voluntarily reported to EEI by the utilities.

Utility networks account for only about 10 to 15% of askarel transformer installations. The rest and by far the greatest number of askarel transformers are located outside of these networks, scattered thru industry, commercial buildings, shopping centers, hospitals, schools, institutions, etc., usually privately owned although served by the utility's lines. As the utility people often advise these transformer users, we are intersted in knowing the utilities'attitude toward askarel, even though they may not feel need for it in their own network.

The last report issued by Edison Electric Institute was in July 1961 and covers the 1956 - 1958 accounting. I have tabulated and compared as attached, this period against the previous period, namely 1953 to 1955, as this clearly shows the popularity of askarel versus mineral oil and indicates all changes and trends, at the utilities.

Out of the 61 leading utilities reporting to EEI, 22 have not felt need to avail themselves of the safety features of askarel and instead employ, collectively, a total of 5,850 mineral transformers in their networks.

Of more interest and encouragement to us is that 39 of these large utilities having networks of at least 20,000 KVA capacity, reported using both askarel and mineral oil. In the 1953 - 55 period, the askarel units totaled 3,785 and mineral oil totaled 14,819. In the following period, namely 1956 - 1958, the askarel units totaled 4,543 and the mineral oil 20,444. This reflects an askarel percentage of 20.3% and 18.2% respectively for the two periods.

However, if one cares to take Consolidated Edison out of the picture, eventhough they have indeed favored us with increasing the askarel units from 796 to 879, one finds that the askarel popularity in the utility networks is 32.9 and 32.6% respectively for the two periods. This seems a good percentage for a specialty and it is encouraging to note that a number of the utilities are extremely strong (60, 70, 80, 90 and even 100%) on askarel.

Also, it seems significant and encouraging to us that 36 of the 39 utilities using askarel increased their askarel percentage in the latter period. All these favorable signs help to underwrite the reason why our transformer askarel business continues to be healthy. The results have been far different than the gloomy picture forecast by John Harris, some years ago.

Edison Electric Institute

Utilities Reporting Using Both Askarel and Mineral Oil Net-Work Transformers and Having More Than 20,000 KVA Capacity

City	Utility	1953-1955 (Data Published Dec. 1957) Askarel Units	Mineral Oil Units	Percent Askarel Units	1956-1958 (Data Published July 1961) Askarel Units	Mineral Oil Units	Percent Askarel Units
Albany, N. Y.	Niagara Mohawk	Did not report		-----	68	18	79 %
Schnectady-Troy	" "	99	134	42.5%	Did not report		-----
Atlantic City	Atlantic City Elec.	18	135	11.8%	9	169	5.1%
Baltimore	Baltimore G. & E.	116	129	47.4%	142	128	52.6%
Baton Rouge	Gulf States U.	1	68	1.2%	3	81	3.6%
Boston	Boston Edison	43	241	15.1%	60	313	16.1%
Buffalo, NiagaraF.	Niagara Mohawk	41	112	26.8%	59	115	33.8%
Chicago	Commonwealth	813	159	83.2%	1,049	156	87.0%
Columbus, O.	Col. SO. E.	Did not report		-----	6	128	4.5%
Dallas	Dallas, Pwr & Lt.	3	524	0.6%	3	561	0.5%
Denver	Pub. Ser. Colo.	122	31	80.0%	175	28	86.1%
Des Moines	Iowa Pwr & Lt.	18	132	12.0%	9	141	6.0%
Fort Worth	Tex. Elec. Serv.	77	165	31.8%	87	171	33.7%
Hartford, Conn.	Hartford Elec Lt.	23	49	31.9%	39	84	31.7%
Jacksonville, Fla.	Jacksonville Elec.	87	6	93.6%	Did not report		-----
Kansas City	Kansas City P & L	111	0	100.0%	126	0	100.0%
Knoxville, Tenn.	Knoxville Util.	38	55	40.9%	Did not report		-----
Lincoln, Neb.	Consumer's Pub. P.	29	66	30.5%	Did not report		-----
Louisville, Ky.	Louisville G & E	88	29	75.0%	" " "		-----
Memphis	Memphis Lt. G & W	185	37	83.4%	" " "		-----
Mexico City	Mexican Lt & P.	7	91	7.0%	" " "		-----
Miami, Fla.	Florida Pwr. & L.	88	103	46.0%	122	85	59.0%
Minneapolis	No. States Pwr.	140	75	65.0%	206	55	79.0%
St. Paul	" " "	51	16	76.0%	71	16	81.8%
Newark	Pub. Serv. E & G	45	2,359	2.0%	144	3,209	4.3%
New York	Con. Edison	796	8,745	8.3%	879	12,884	6.4%
Oklahoma City	Okla. G & E	80	84	48.7%	92	77	54.4%
Pittsburgh, Pa.	Duquesne	12	459	2.5%	17	496	3.3%
Portland, Ore.	Portland Gen. E.	1	147	0.7%	Did not report		-----
Poughkeepsie		Did not report		-----	19	81	19.0%
Providence, R. I.	Narragansett	51	43	54.2%	49	41	54.4%
Richmond, Va.	Va. Elec. Pwr.	162	16	91.0%	188	15	92.5%
Rochester, N. Y.	Rochester G & E	27	132	17.0%	28	151	15.6%
St. Louis	Union Elec.	223	48	82.0%	222	102	68.5%
SaoPaulo, Brazil	Sao Paulo Lt & Pwr.	11	330	3.2%	Did not report		------
Springfield, O.	Ohio Edison	Did not use askarel		-----	2	124	1.6%
Syracuse	Niagara Mohawk	Did not report		-----	27	25	52.0%
San Francisco	Pacific G & E	" " "		-----	Use 5% mineral oil and 95% non-flammable.		
Toledo, O.	Toledo Edison	67	14	82.8%	Did not report		------
Wichita, Kan.	Kansas G & E	71	64	52.6%	88	60	59.4%
Worcester, Mass.	Worcester Co. Elec.	41	21	66.1%	Did not report		------
Totals		3,785	14,819	20.3%	4,543	20,444	18.2%
Totals, without Con. Ed.		2,989	6,074	32.9%	3,664	7,560	32.6%

However, let's not forget the prime problem that keeps askarel a specialty instead of a bonanza. Indeed the effect of this can be gathered out of this same list of utilities, whether or not they use askarel in their networks. All are informed and mindful of each of the (few) askarel explosions.

This is the reason why Union Electric who have 222 askarel units have not added more (in their network) although they increased mineral oil units from 48 to 102 over the period, reported.

While I know that U. E. has been getting excellent performance from their askarel units and have no intention of "throwing any out", (as confirmed by their report to EEI) -- yet U. E. just can't forget the askarel transformer that exploded years ago in Vandervoort's department store. There was no fire and the arc formed gas being HCl, precluded a secondary explosion, but the primary explosion and smoke created was enough to cause mass hysteria by the shoppers. It was a poor place for an askarel unit to explode, and all utilities learned about it from their EEI reports.

I know that my friend Earl Thomas, the chief at Consolidated Edison and an international authority on utility apparatus, will never forget the askarel unit that tore things apart in his network. This lead Earl to employ mineral oil, under a blanket of nitrogen in completely welded (hermetically sealed) units. It can be argued that these are potential bombs and if one ever lets go, NYC will be shaken.

But let's not miss the point. By employing the proper transformer design technology to accomplish everything possible to eliminate explosion, Earl Thomas has successfully put his international reputation on the line by using even mineral oil to do the job safely over the past good number of years. We are having a very long wait for one of his mineral oil network jobs to blow and obviously Earl is convinced that none will fail. His confidence stems from the fact that he knows exactly what goes on in the Con. Ed. network and none of the many engineers under Earl would care to violate any suggestion or directive handed down from Earl Thomas.

There is no difference between Mr. Thomas and ourselves regards knowing what is required to provide explosion free operation of liquid filled transformers. But there is a tremendous difference between his position of being able to see to it that this is done in his own network vs our position of little control over many other people, dealing with askarel, who inadvertently fail to fully realize these requirements.

There is no use of my threading thru other examples that I could extract out of this list of utilities involving failure of askarel -- the lesson is that the few blows that occurred have hurt us badly.

It should be clear that the only fundamental problem regards transformer askarel is this possibility of primary explosion.

This can be greatly minimized and in fact eliminated, but only by emphasizing the proper design technology for the askarel units.

To clarify this sophisticated sounding term -- we are not saying that faults have been found in the geometry and stress designs employed for askarel transformers, within the limits of their normal voltage ratings. This is to say that the electrical design is excellent.

The reasons for askarel failures are due to improper selection of construction materials, and especially to inadequate sealing to keep out moisture, which is its worst enemy.

There is nothing complex about this. It lies well within our capability to emphasize and publicize the importance of avoiding inexcusable mistakes in these areas and to offer Monsanto assistance where needed.

We already pointed out that even the poorest askarel design guarantees against fire and secondary explosion. We now wish to add to this by saying that with frequent use of less than the optimum and even with use of inadequate construction components and sealing arrangements, there have been very few askarel explosions.

But these few primary explosions have held back the wider possible use of askarel. And it does no good to feel that the effect is way out of proportion as after all askarel owes its existence solely to safety.

Our steps to correct this problem have been developed with full collaboration from G.E., Westinghouse and most all of our customers. It is gratifying to know that from all angles, the feeling is that what we are doing and especially our approach to maintenance guidance is in great need, notwithstanding that G.E. and others have had the responsibility for 30 years now for promoting use of their patented transformer askarel. While G.E. more than others, did a tremendous job promoting askarel, today all graciously agree that our steps should

lead to better understanding and wider use of improved askarel technology. This as mentioned before, is the only realistic approach to building maximum confidence needed to increase the use of askarel transformers.

P. G. Benignus

PGB:pb

X X X X X X X X X X X X X X

Not that we are in need of further conviction, as we have said clearly what the problem is -- the actions of fate had to enter, as though there were need to emphasize the problem just as I was writing the last paragraph.

It was a phone call from one of the smaller (relatively new) askarel transformer makers. He had sold eight units to a customer and all are coming back -- the one that exploded is coming in pieces!

Neither the customer nor the maker have facilities to test for parts per million of moisture. They don't need such at this stage -- the water can be seen in globules on top of the askarel -- and as we have emphasized, water is its worst enemy.

The maker used nitrile rubber gaskets (recommended in G.E.'s askarel maintenance guide). We know that this rubber will deteriorate in the presence of askarel -- it did and the amount of water that entered was enough to break down any electrical insulation system. Although it took an explosion for these people to recognize the problem, it will not be difficult for them to correct the discrepancy.

Before this firm began making askarel transformers, they were given our comprehensive book on proper handling, earth refining, analytical techniques, construction materials, askarel transformer characteristics, etc. Now I find that they do not even have earth

refining and filtering facilities. They simply take our guaranteed specification quality askarel and dump it into the transformers and ship the units. Who knows to what extent the fluid may have been contaminated from construction components, etc.?

However, now these people will have to get equipment to rework the water contaminated fluid, and this can be done very easily.

Then as these folks have no analytical facilities, of course, we will have to determine whether they accomplished adequate refinement of the fluid. This is not difficult for us to do.

However, as we will need do a good deal more of this kind of testing, (than was done in the past), we have set up to charge for it. This allows the much broader offering of our services, as being announced in our promotional campaign.

In the past, our customer service laboratory workload has been 1/20 th of a man. Our new program is slated for 1/4 th of a man! (I mention this not to imply that I understand exactly what 1/20 th or 1/4 th of a man is, but to say that we try to do a hell of a lot with very little.)

While we will never accomplish the control that Earl Thomas has over his network, our campaign will help us get the message across to the many others who need better understanding and control of transformer askarel.

Especially our maintenance guide will accomplish more user confidence and each facet of our over-all program will help stimulate askarel sales, as we continue to move more strongly out of the box that Monsanto has been kept in so long (by request) -- that we merely guarantee that the askarel we supply meets all the strict property specifications established by the transformer industry.

P. G. B.