Anthony Coker

“

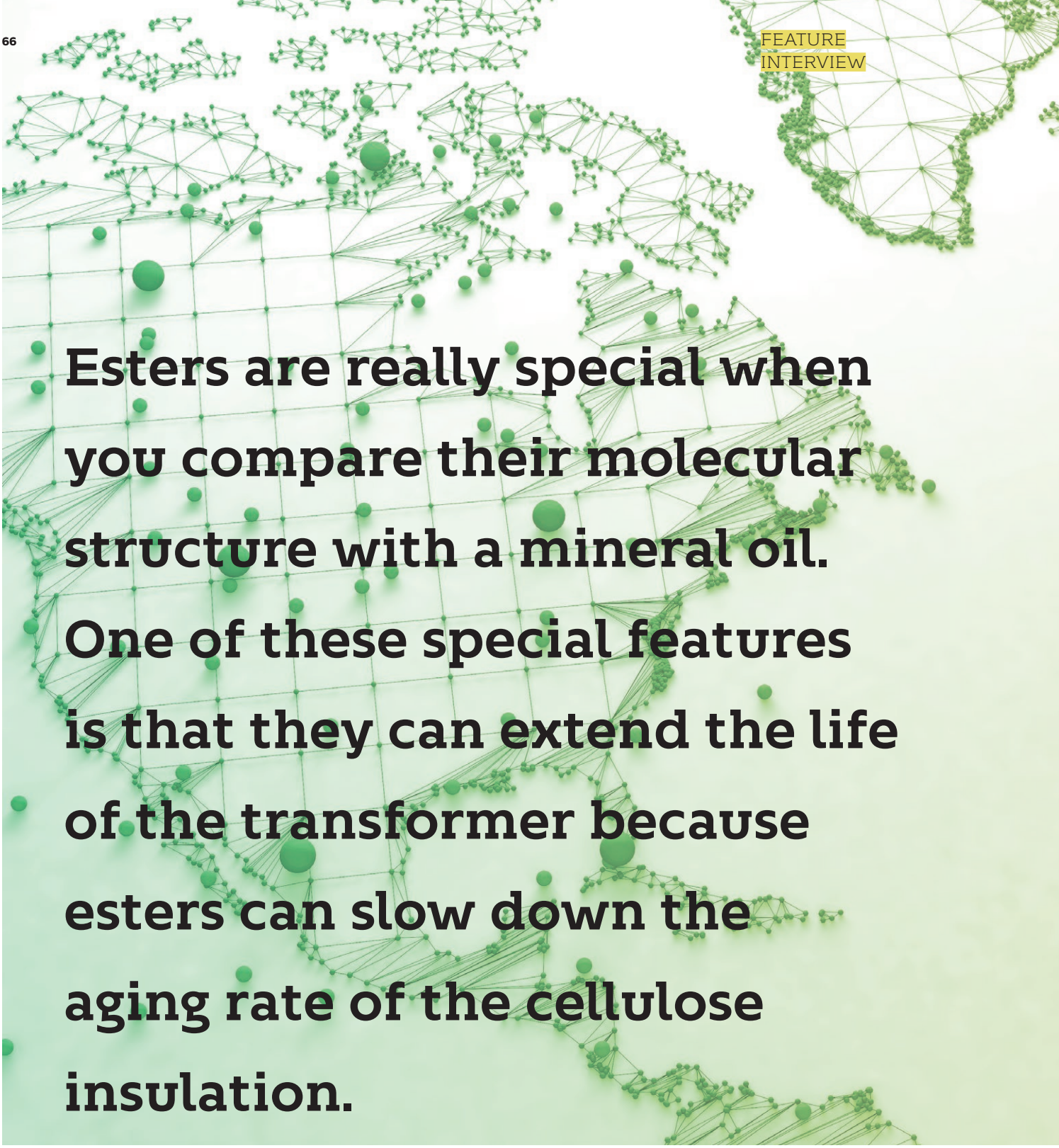
We are seeing growth in retrofills because it is difficult to source new transformers right now. Retrofilling is a smart way to maximise the life and the value of the asset. It's a far quicker and often cheaper way to achieve risk mitigation.

[MIDEL®]
MIVOLT®

Photo: Midel & Mivolt Fluids

Executive Vice President of the Americas
at MIDEL & MIVOLT Fluids Ltd.

Interview with **Anthony Coker**



Esters are really special when you compare their molecular structure with a mineral oil. One of these special features is that they can extend the life of the transformer because esters can slow down the aging rate of the cellulose insulation.

Alan Ross: My guest is Anthony Coker, Executive Vice President for the Americas with MIDEL & MIVOLT Fluids. Thanks for joining us. Anthony, talk to me about the adoption curve of esters and what is happening at MIDEL.

Anthony Coker: Yes, the adoption curve is a good way to put it. I don't think we are quite at a hockey stick inflection point yet, but it is a high growth set of products right now with esters around the world. There are a lot of suppliers spread around the globe. We've been in it for 45 years, so it is nothing new for us or the market. We started in Europe, where Synhtetic Ester MIDEL 7131 was patented and invented: when it was time to replace PCBs back in the mid to late '70s. The growth of synthetic esters started then, and decades later natural esters popped up regionally around the world, where you still see some strong regional players. But with MIDEL, we've been fortunate to be in both natural and synthetic esters for the last 20 plus years.

AR Really? I didn't know it was that long.

AC Yes. In both Europe, United States, and Asia for MIDEL. You are right, you did not see a great deal of us in the US

Photo: Shutterstock

probably until about six years ago. A lot of our big OEM customers said, “You're a globally used product, so we are taking you global with us.” We have big customers in the States and throughout the Americas that want MIDEL to be there, so we established a subsidiary in the US to support them like we have done in Africa and Asia.

AR What are the specifications that make esters the best choice for transformers?

AC That is a good question, because there are a number of parameters, depending on the application and the end user, the utility or the commercial customers’ needs at the time. It first started off with fire safety. A fire-safe fluid, an FM-approved fluid, that is UL-classified. Those were the main drivers. For a while biodegradability was just icing on the cake. Nobody really specified that decades ago. The world has changed since then, however. In some cases, engineers, companies, and utilities are now leading with, “We want it biodegradable. We want it non-toxic. We want it to be safe for flora and fauna.” That's driving it almost as much as fire safety now. Fire safety is still a big deal, though.

I want to continue to be the trusted advisor to these utilities and end users. I used to be just the ester guy. Now I can support where mineral oil suits the application best and where our natural and synthetic esters suit the applications best.

AR Deciding on specifying esters is no longer about size, right? Would you put a natural ester or a synthetic ester in a GSU?

AC Oh, absolutely! We have a giant project that is going to use all synthetic ester up on the Columbia River this summer, and it will be part of a green hydrogen project. All those GSUs are using synthetic esters for the first time and replacing mineral oil. Those are new units. Also, about an hour south of Sacramento, where we are today, there is a giant retrofill project as well, on waterways. It is pumped hydro, so you can get water pumping for storage, or you can generate with the GSUs off of that, and those are being retrofilled with MIDEL 7131 synthetic ester to replace the mineral oil.

AR Okay, so size no longer matters.

AC I would say you are right. Use cases needed to creep up in size and voltage and the designs needed to get there. Demand from utilities is pulling the OEMs higher and higher up to 500 kV. That's where we are now. That is going to be a lot more of the market with some of those bigger units, and there will be demand for even higher voltage classes than that coming in the near future.

AR Where were we 10 years ago in the acceptable size application?

AC You know, 10-20 years ago, it was probably somewhere around 69 kV.

AR You can see that difference. We need to get the word out because people still think you can't use natural synthetic esters. Retrofills are something that the industry, the users, are afraid of. But at the same time, it's happening over and over again. But the question I have is - why retrofill? Why would you suggest it to somebody who's already got a transformer?

AC Well, there are two main reasons: Fire Safety and Sweating the Assets. As we just heard from a couple of the experts in the industry at this conference describing how difficult it is with supply and demand imbalance right now. So, you look to keep current assets

Photo: Shutterstock

operating as long as possible today. How do you do that? That is a very expensive unit or set of units in that substation. Do I have to look at replacing them fully? If I am being required by my insurance company to make them fire safe or make the substation fire safe, put in firewalls, put in extra containment, fire suppression, do I do all that, or could I retrofill if the units are worthy of it? Or do I wait three or four years for new units? We are seeing growth in retrofills because it is difficult to source new transformers right now. Retrofilling is a smart way to maximise the life and the value of the asset. It's a far quicker and often cheaper way to achieve risk mitigation.

AR At this conference I just moderated a panel where we heard about people using high powered rifles to shoot at transformers, trying to knock out a substation. If you hit a bushing and you hit it just right, the oil under pressure can create a fire that cannot be extinguished. You just let it burn out.

AC Yes, the bushing is probably the weak spot to cause that fire. You are correct, but if filled with MIDEL, that would not be a fire safety issue on top of an active shooter issue. And, then your environmental risks from the transformer liquid, and also don't forget the fire fighting foam; are also mitigated.

AR Going back to retrofills a little bit, you mentioned getting more life out of a transformer.

AC Yes. You have a lot of money invested in them. How can you extend the life of a transformer?

AR How does a retrofill extend its life?

AC Esters are really special when you compare their molecular structure with a mineral oil. One of these special features is that they can extend the life of the transformer because esters can slow down the aging rate of the cellulose insulation.

AR Really? By percentages, do you have some data about it?

AC You cannot guarantee, in a retrofilled unit, how much more life you are going to get out of it, but you know you can slow down the aging rate. Now, on a new unit, we have had some utilities in certain parts of the world say, "We will go forward with this project with using your esters because we know we can get 20 to 25 % more life of that transformer", so it pays for itself easily that way.

AR Let's talk about moisture wicking, that an ester actually takes moisture out of the transformer. I believe the life of a transformer is the life of the paper and moisture in a transformer degrades the paper. Talk a little bit about that, about moisture in a transformer.

AC Two things occur with moisture in an ester-filled transformer. First, in mineral oil, oil and water separate, right? In ester, again, the magic molecule, it has a hydrogen bonding property with water molecules. You get the hydrogen bond of the H_2O with the ester double bonded oxygen, and you lock up the water in that solution. And it's not a separate solution, it's in the ester. You can do that to a certain percentage. For instance, with a synthetic ester, you can go to a very high water saturation level, approximately 2,500 parts per million. At high water saturation, it is still the great dielectric liquid which you originally asked it to be, but it has also been able to grab the water in the unit in comparison to mineral oil.

And second, where is some of the water coming from? The water is a breakdown characteristic of that cellulose aging. If you can grab the water away from the paper, you have accomplished this: It slows down the aging rate because it binds to the water. And water is a catalyst for more cellulose breakdown. So you have the ability to bind water in solution and thus decrease cellulose breakdown.

AR Talk to me a bit about that break down.

AC The cellulose molecule itself will break down in a mineral oil or ester environment, any environment, even inside a transformer, even if it is sealed, it is going to see a little bit of oxygen, a little bit of a moisture, and a maybe a lot of heat. Those things help break down that cellulose chain. When it breaks down, it gives off some other different molecules. It gives off short-chain fatty acids, long-chain acids, and water. If you can keep the water from going back and catalyzing that reaction by holding it in the ester, you slow down that reaction. That is one of the keys. Also, we have actually seen in marine environments, and applications on shipboard where they use synthetic ester because it can actually help dry out the transformer. Some of the first retrofills that were ever done in England were at naval dockyards, where they had wet transformers, and they used it to retrofill and dry them out.

AR Do esters have a better capability of handling heat? For example,

if you're in Texas in July it is hot, and you need to operate those transformers above rating. They're at 120% or even 130% of rating longer than normal. Do esters handle it as well, better, or worse than mineral oil?

AC If we could draw a curve right now, a heat vs. time aging curve it would show that when the cellulose heats up in the transformer, the life of the insulation is reduced. It ages quicker and we lose time from its initial lifespan. If you run the cellulose in ester hotter, i.e. operate the transformer at higher temperature, you can get the normal amount of life out of that transformer that you would with mineral oil, or you can run it at a normal top load temperature that you would with mineral oil and get the extended life. That is actually how you can dial in loading and temperature with esters. I can run them hotter. I can safely short-term overload them better. I can design in a little bit of overloading. That is what some of the utilities are looking at right now. It is another feature.

AR Owners must be looking at this because their assets are being asked to do more consistently and constantly. Last question is what does the future look like? Other than growth, what does the future look like?

AC We are currently a member of the Shell Group as a portfolio company, but are on the path to being integrated into the global Shell business. We were a smaller British company, privately owned - now we are part of a major global company. Together we have some great capabilities globally. You will see a lot of these come to bear for our global customer base right across the markets we serve, particularly around logistics, supply chain and capacity.

AR You know, one of the things I thought when I heard this is that it is almost counterintuitive that an oil company invested in and bought a natural and synthetic ester company, one of the oldest leading synthetic companies. It appears that it just gives Shell

Photo: Shutterstock, Midel & Mivolt Fluids

the ability to offer more to customers than they did before.

AC I think you just hit the nail on the head. I feel being part of that wider Shell family is great. MIDEL has always been in the position of being a trusted advisor to utilities and end users in selecting the right ester type for the job. The same is also true for Shell in pioneering its gas-to-liquids (GTL) technology, by the way. Going forward, being part of a leader with a broader portfolio of products will only increase the value we bring to the global transformer liquids market.

AR Because until now, I has been a battle between the two. And now what you're saying is, this is no longer a battle. This is what is best for the industry.

Anthony, thank you so much.

AC Thank you, Alan, I appreciate the opportunity to share with your audience.