Applied Seals North America (ASNA) Discusses the Seals Industry and Technology

Gases & Instrumentation International had a wonderful opportunity to talk with Dalia Vernikovsky, President and General Manager of Applied Seals North America, regarding their recent press release (See news, page X) and about the seals industry.

GASES & INSTRUMENTATION: The recent press release of ASNA announcing your volume purchase order for perfluoroelastomer sealing solutions for all of the chemical vapor deposition (CVD) and etching equipment at a major wafer fab caught our attention. The first question we have is, does ASNA do all of its own manufacturing of the seals that will be supplied to the fab?

DALIA VERNIKOVSKY: Yes, all manufacturing is done in Taiwan by Applied Seals, a wholly owned division of our parent company, GMORS. It's an offset from the larger manufacturing that they do for the industrial sector. GMORS provides sealing products for every major automobile manufacturer in the world and is actually the second largest manufacturer of sealing products in Asia. They have a complex distribution network and have grown to become a large global company, in business since1981.

G&I: How did Applied Seals North America arise?

DV: Applied Seals North America was their next growth phase, which focuses on semiconductors and related industries such as solar — all the "clean" industries. They started their operations in these areas in 2003 with full production in 2006 for all the new perfluoroelastomers used in these industries. So all the seals that we deliver are manufactured internally. GMORS/Applied Seals is a highly integrated company with all the tooling done in-house so that we can control all facets of the products, which is one of the benefits of ownership. The only thing that is not done internally is making the base polymer, which GMORS/Applied Seals purchases from chemical companies.

G&I: I notice that some of your suppliers are DuPont, Nippon, etc. Knowing that they too are competitors in the same market space, how does that affect your business model?

DV: First of all, it's a very gray world to start with in the semiconductor space. GMORS buys predominately from DuPont for the Viton® product as DuPont is also the base chemical company making both the polymer and final product; GMORS chooses to buy that polymer from them and make it into their own Viton-based product, as many seal companies do. We also buy from 3M and Solvay. GMORS and Applied Seals can actually buy polymers from anybody and make our end products with all the variations and curatives that are available on the market.

G&I: I notice that Viton is also a copyrighted term for the carbon-based polymer that is used in that particular seal. When you are purchasing that compound, can you represent it specifically as Viton?

DV: Viton is indeed copyrighted and we always represent that fact; Viton is to polymer like Kleenex is to tissue. In the world of normal seal manufacturing, you call it FKM. The thing about the semiconductor industry is that when you use the terms FKM and FFKM, it really doesn't speak to the customer; it's not their language. So we use Viton as a term recognizable to them. What many do not know is that there are over 100 different variations of these materials. Many engineers do know this. This is what frustrates me sometimes. Many engineers do not understand that there are variations in the materials. To add to the complexity, there are a variety of curing agents and fillers that act to give the seals their definitions, their characteristics. Many in the industry are often looking for something equivalent to what they had or less costly.

G&I: It's always a cost down initiative.

DV: Yes, always. Or a CoO (cost of ownership). Lack of standards and lack of education in these materials is going to bite the industry badly, if it isn't corrected. We're working to do that.

G&I: And that's typically why they rely on organizations such as yours and your application engineers to give them the insight?

DV: Yes. Many times it is purchasing that says "give me something better or more cost-effective"; or they will test it themselves, and therein lies some of the problems. Engineers are not always familiar with what makes an O-ring an O-ring. They think it is a simple thing, without much exposure to sealing technology or understanding of why they would need to.

G&I: So they don't really understand the technology and need to be educated?

DV: That is my main message. I am working heavily

on all levels to do this. I worked many years with a formidable competitor—my main message was always education. You don't really have to hit them over the head, just inform them of the issues. I'd say at least half of the issues with perfluorelastomers are sizing and installation. Sometimes the hardware is not sized at the level that it needs to be for an O-ring fit with a Viton-like material. It's forgiving; it will stretch, but if you stretch it more than 2%, you can break the Teflon™ backbone chain (for simplicity of discussion), which then causes erosion, leakages, and early failures.

G&I: With the employment situation, lots of people leave jobs and others take over their responsibilities. So training is an ongoing thing?

DV: That's part of it. Often, the new engineers are not taught the basics and some of the Ph.D.s that come into the material world may not be looking at the applications. There can be this dichotomy of great material engineers that are looking at the backbone of the material, but may not realize the final application—how it effects the seals; they may not look at the details of that application (and realistically, are not cognizant of the mechanical requirements as well), and as I always say, "The devil's in the details."

G&I: You mentioned earlier that, often times, purchasing is driving the bus in regards to the decision making as it pertains to seals.

DV: It's really an ebb and flow; it trends one way and then it trends another. The bigger fabs want to globalize and control inventories worldwide, so they want to see purchasing buying engineering that drives it; some don't.

G&I: Is it also tied to the economy?

DV: About 10 years ago, I would ascertain that engineering predominately made the decisions. After that, when the economy dipped, purchasing took over. As engineering regains some of its glow because of new technologies, I think it will shift back.

G&I: How has the burgeoning photovoltaic market changed things for seals?

DV: It's more back to the LCD market for high-tech seals. PV manufacturing is not as clean demanding, but there are significant amounts of custom sizing, and some huge seals. They do use some selenium (and other chemistries) so we have to look at outgassing of these materials. Applied Seals has the ability to custom make these extremely large sizes. It's more custom-shaping and sizing than unique materials.

G&I: Does that mean that the PV manufacturers have not standardized their own process equipment?

DV: Correct, because the manufacturing is in early stages, the industry has not completely determined what the technology should be. But as for standards, I am going after that too. Just as I am working on standardizing O-rings. Because even in the semiconductor industry, there are still no standards for O-rings. There ARE standards in the military and aerospace markets, but not in the semiconductor industry.

G&I: There is a tendency for the industry to experiment with more aggressive chemistries and increased temperatures in order to increase throughput. This means maybe they will have to be more concerned about their seals. Are they looking at the OEMs for guidelines?

DV: Many fabs do think that it is the OEMs responsibility. The interesting part is that the fabs cannot often give the final recipes to the OEMs. NF_3 is a prime example. When NF_3 became a standard cleaning gas and replaced TEOS, it significantly affected all the O-rings. So it is the cleaning more often than the process that actually hurts these seals. High amounts of fluorine obviously are a major factor. The difficult part is that the OEMs don't always know the full effect of a process. More often than not, the OEMs are looking for cost effectiveness, which may mean an unintended loss of performance. So in some cases, the fab feels the full brunt of the problem.

G&I: Do you think then that the fabs think of O-rings as a commodity?

DV: In many instances, yes. In standard O-ring usages where chemistry and plasmas, as an example, are not factors, they are. Even in FFKMs, everybody has the same formulas, and many use the same kind of perfluorelastomers, so we are not building atomic bombs here; but it is the way you manufacture these O-rings that makes a big difference. The OEMs will reproduce the same hardware over and over again. It is in their database. If they want a particular seal or sealing area for that seal, they will look in their database and create the same type. So many times it's the same problem reproduced over and over again. They are not designing for O-rings; they are designing for chambers or the 'differences' of materials that have changed along the way. The O-ring comes along for the ride.

GI: Who makes the recommendation for seal change out?

DV: It's difficult. Many O-rings are brought in after the fact. We make recommendations and work closely, if we can, with an advanced tool to ensure the proper seals and maintenance schedule. However, many of the recommendations come from the OEMs directly with a PM (preventive maintenance) schedule. Adding to the complexity of this issue is the fact that O-rings are not meant for some of the dynamics of high-vacuum environments that some of the chambers are trying to reach. O-rings were not developed for vacuum; rather they were developed for high pressures of 500psi or more–completely inverted from what the semiconductor industry requires.

G&I: As far as determining the life of the O-ring, is that done by internal testing at Applied Seals or by looking at field data?

DV: Seal data is precious. If we can get field data and we can share it, that's ideal. We do our own studies today and most responsible suppliers do. Some labs can do testing. We found one lab in Taiwan that could do NF3 testing, for example. Field test data is of high importance, but is hard to come by. If we give fabs samples to be tested, they will share that data—if it fails, why it failed, or if successful, how long, etc.

GI: Thank you for this insight into the world of seals.

NOTE: *Gases & Instrumentation* will be featuring, in upcoming issues, a detailed look into the technology of seals and their semiconductor and photovoltaic applications.