

KNOWLEDGE IS EVERYTHING

In liquid terminals around the globe vapor recovery has become a necessary fixture. Vapor recovery systems prevent pollution and help safeguard the health of the global population. So, when you consider buying a new vapor recovery system you assume that the supplier knows everything about it. After all, vapor recovery has been around since the 1970s, right?

Well, 1970 was over 35 years ago. If you were just out of college in 1970 you're approaching retirement today. If you were a "seasoned engineer" 30 years old in 1970 you're 65 today, and probably retired! So, what happened to all of the knowledge gained along the way?

What happened was that in the 1960s the US government built a vapor control knowledge base by mandating vapor testing and documenting results in the Code of Federal Register (CFR). That base was used by early design engineers to develop the root technologies first applied in the pursuit of vapor control in the 1970s. As the first "discovery" years wore on, most of the technologies proved to be flawed and the purchasers of these systems looked to the remaining technologies. By 1980 the industry had convinced itself that the carbon adsorption technology was the best and most cost-effective of them all, and the others died off.

A few firms honed in on this basic technology and developed their own designs with enough twists and turns (they call these features and benefits) to compete with one another. By 1990 only one firm in the US and one firm in Europe had survived. Competitive pressures had driven smaller or weaker firms from the market, or they had been absorbed by the survivors. Patents filed in the 1970s and early 1980s then began to expire. New firms took advantage of this, and began to compete for the market previously monopolized by the two surviving firms. Some survived while others did not.

Competitive pressures in a mature market can be brutal. With stockholders demanding higher and higher returns, the motivation for "better" products often succumbs to the demand for higher profits. This means fewer and fewer dollars flow into any efforts to improve a product, and all efforts turn to subjects like "value engineering" where anything not absolutely necessary is removed to grow the profit margin.

The fallacy in all of this is that knowledge usually takes a back seat. While philosophically knowledge may be everything, in reality, profit margin usually trumps knowledge.

The consumer ultimately suffers and benefits from this at the same time. When a consumer good like soap or tooth brushes are concerned, a focus on profits ultimately cuts development and product costs, and the consumer price goes down. This is, of

course, a good thing. But, where highly technical processes are involved, any loss of focus can sacrifice the value of the technology had in the first place. This is not good.

Competitive pressure in the 1970s and 1980s did this to vapor recovery technology.

After all, every vapor recovery system is a chemical processing plant. It uses a technology generically known as "short-cycle, pressure swing adsorption with two-phase counter flow mass transfer absorption". Chemical processes like this can be found in all chemical and petrochemical plants, and in refineries through the world. The designers of these plants are careful to make certain that the components are sized and configured properly, and to make sure the flows, temperatures and pressures are monitored and controlled continuously to optimize the efficiency of each and every process. No plant could operate without it. The need to know incoming flow, temperature and pressure, processing conditions, and effluent flows, is a minimum in all processes. This is considered necessary for the normal control of those chemical processes.

However, this was all lost on the vapor recovery process from the very beginning.

Three forces were at play. The US Clean Air Act of 1970, revised in 1990 to include all USA terminals, forced terminal owners to install vapor recovery systems almost immediately or face large fines and bad press. The US EPA was created at the same time, with enforcement powers to levy those fines. The issues of eminent deadlines and enforcement drove suppliers to provide systems as quickly as possible. Competitive pressures played a big role in eliminating instrumentation considered necessary in most other processes. This meant making wide-sweeping process assumptions so sophisticated and often costly instrumentation could be eliminated, cutting costs and reducing delivery times to be more competitive.

We live with the results today. Nearly five decades of applying 1970 assumptions to nearly 1000 vapor recovery plants worldwide, plants supplied without built-in emissions measuring systems, the industry suffers from a huge knowledge gap.

In 2003 a group of forward thinking individuals decided to change all of this. They formed a company called SYMEX Technologies. The goal was to develop a VRU that was not based on competitive pressures, but on performance, energy efficiency, and user friendliness. The founding design principals of SYMEX Technologies were:

- Be innovative.
 - There are no constraints.
- Eliminate all of the weak links in past systems.
- Do not focus on competitive pressures.
 - Informed clients understand intrinsic values.
 - They make informed decisions!

- Better is better.
 - Cheaper is not better.
- Focus on process efficiency and energy conservation.
 - The cost of energy will only increase in the future.
- Make it smarter.
- Do it right.

From these principals flowed the basis for a new era in vapor recovery. Untethered by pricing constraints, the design team was free to select from the best available components and sub-processes.

The design team was hand picked from the best minds in the industry. All members of this elite team had worked in the field of vapor control for three or more decades. All engineering disciplines were represented. All also had hands-on experience and knew the pitfalls of all existing systems. Each member was unencumbered by employer prejudice or the "not invented here" syndrome. Each was enthused to have an opportunity to apply what he or she had learned. Each was and is a highly regarded independent business owner/consultant, and all remain focused in this field of work today.

Throughout the system design process it was clear that all members of the team agreed that this process should include the instrumentation afforded all other processes. This would allow the dissolution of ALL assumptions, and give the process the best chance of controlling itself to achieve the goal of maximized efficiency and energy reduction.

As each member of this team contributed his or her experience to the new design it became obvious that when we developed the operating software for the new system it must include those combined experiences. Great care was taken to make certain this actually happened.



The DRYVac™ System evolved, and continues to evolve. Today it has the most complete internet of things (IoT) of any vapor recovery system on Earth. Its artificial intelligence (AI) is also the smartest. It makes decisions based on input from every instrument, not assumptions. It measures and calculates the mass of hydrocarbons entering the carbon beds ten times each second, and manages itself accordingly. It reports the volume of recovered gasoline every second of every day for the operators and terminal managers see on the user-friendly computer graphics screens. It uses the best software on universal platforms like General Electric, Allen Bradley, and Siemens have to offer, and records every operating event and value in charts and tables

stored on the hard drive and client's server for posterity. The vapor recovery systems of the past measured nothing, had no intelligent software, and kept no records. They assumed average liquid loading and inlet vapor flows, and made no adjustments for the busy or slow times occurring daily in every terminal facility. They just operated at the same pace 24/7, whether they needed to or not, often wasting energy. Worse than that, they did not measure emissions. The owners/operators had to assume that since they were running they were working as promised. It took more than 30 years to begin to test these units, and to prove that most were failing to control air pollution. They were then, and many remain now, quite rudimentary.

DRYVac™ from SYMEX Technologies changed all of that. DRYVac™ started out using 21st century electronics and software, and SYMEX Technologies has continued to make the DRYVac™ AI better and smarter ever since. We can monitor the systems we've installed via the internet, whenever the owners allow us to, and we have done so from China to Ecuador, Hungary to Ohio, all around the Globe. As a result, we now have several thousand cumulative days of minute-by-minute operating data on the installed systems; the most useful hard data found anywhere else. From the careful study of that data we have learned more about how these systems actually work, and we have applied what we learned. Today, each new system is the smartest vapor recovery system money can buy, and each one is a little smarter than the last.

Sharing knowledge is critical. Learning from it is equally critical. So, we listen to our clients, and we learn!



When one client pointed out that one of his two carbon beds was coincidentally regenerating less than the other, potentially becoming overloaded with hydrocarbons, we modified our ESP™ software so the two carbon beds automatically adjust their own regeneration times to balance out one with the other, preventing what that client had previously observed. Now, that "bed balancing" software is a part of the AI in every DRYVac™ System.

After all, knowledge is everything!