

# MAGIC HAPPENS WHEN YOU COMBINE ARTIFICIAL INTELLIGENCE WITH THE INTERNET OF THINGS

The world of processing has changed dramatically since the year 2,000. And, rightly so! Software authors didn't even exist just 50 years before! Today, more than ever, what the mind of man can conceive, man can achieve.

So it is at SYMEX Technologies, where we have connected all instrumentation into an "Internet of Things", and manage them all with 21<sup>st</sup> century software that "thinks" for itself, magic happens. The magic we're talking about is the opportunity to build, install, and manage the running of a process plant without the need for human intervention.

Our process plant is called DRYVac™, a name we coined in 2002 for the world's first fully automated hydrocarbon emission control system. Technically, it's a short cycle, dry vacuum regenerated, adsorption-absorption process designed to capture hydrocarbons in the vapor phase and return them to a commercial stream of usable hydrocarbon liquids. It the first of its type ... a real game changer. Today, most vapor recovery systems are modelled after our DRYVac™ System.

We ushered vapor recover unit (VRU) technology into the new millennium by automating it with state of the art instrumentation. Before DRYVac™, VRU's were managed by drum timers, relays, and switches. There was no "intelligence", just on-off cycles switching flows from here to there and back again, regardless of the results. In the earliest days VRUs didn't even measure the results of the process. No one knew for sure if they even worked!!

Then came periodic spot testing. It occurred only once a year, and for only a few hours. As wear and tear took its toll, performance suffered.

Finally, we innovated continuous monitoring automation. We monitored the inlet vapor stream for hydrocarbon concentration second by second. Our software calculated the mass of adsorbed hydrocarbons, and actually adjusted pressure swing cycle times accordingly. This conserved energy, and assured ideal performance regardless of the inlet process conditions. It was a big step. And, eventually, everyone followed suit.

More powerful computers with larger memory capacity allowed us to archive operating data; millions of bits of valuable data over time. As data gathering grew it became obvious that we could and should use it to provide better process control decision making. This aimed us squarely at “AI”, or artificial intelligence.

In artificial intelligence the software interfaces with the archived data to make adjustments in the real time data to maximize the efficiency of each step of the process. All pump and compressor motors are managed using variable speed controllers. All valve movement is managed in real time. All flow rates and concentrations are varied so the desired result is always achieved.

This is all made possible by the carte-blanche use of ever lower cost end devices, and by ever more intelligent software code. By adding required end devices and connecting them all together in their own discrete “internet of things” we can then use the input from each to feed software designed to look at each input, compare it to the data bank of information on file, and make process decisions to manage every aspect of the process three dimensionally.

And the beauty of this is that it is 1) affordable, and 2) eliminates the need to train a host of operators over the life of the system. Operators morph into technicians who now only need to take direction from the AI to replace components when they fail, or better yet, proactively when the AI predicts they are about to fail. Not only is the system smarter, it costs a whole lot less to run, and like the proverbial Energizer Bunny, it keeps on running!

The magic happens at SYMEX Technologies. Let us show you how!

