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Please take 10 minutes and read this it has the potential to save an injury; perhaps even save your life!

Gulf Oil Pipe Blowout; It can happen in *your* plant! Safety Concerns for Processing Polymers

By John Bozzelli

While many are discussing the problems associated with the Gulf oil pipeline blowout; I hear several comments about the high pressures involved. "Can you imagine working at a depth of 6,000 feet and pressures near 2,000 psi? Worse yet the oil is said to be at a pressure of about 7,000 psi. No question about it, there is real danger operating at those depths and pressures. Think of the high-end technology required for this type of work and also that it continues to get more sophisticated. Think of the safety concerns involved. Eleven men lost their lives. What has this got to do with you and your job? If you are involved with polymer or plastic processing, even if you only occasionally walk past an injection molding machine or extruder, it is more than you think. Some of our machines making thin wall parts work at 4 to 5 times, 30,000 to 40,000 psi, the pressures experienced in the Gulf Oil pipe blowout. It is time we all take a break and review some safety items that apply everyday to *your* job. Be it a plant manager, supervisor, processor, quality inspector, setup technician, design engineer, office assistant or operator you need to think about possible equipment failures. Even if you only walk past an injection molding machine now and then YOU need to have your wits about you.

Safety is not a hot topic in our industry. There are a fair number of articles about injuries and death at plants, but few on safety and prevention. So take a short pause from your emails, pressing concerns, routine for the day and review and evolve some safety procedures. Technology has also changed your life and equipment in your plant. One of the problems you must combat it that in your hectic work day to make production, you get lulled into a routine just like those workers on the gulf platform. What are the safety issues, old and new? What you do not know may destroy life as you know it. I say it is time we got proactive and started a "Safety Review"

Where to start? How about the basic concept of what is happening within the equipment you work on, walk by, or is on the other side of the wall of office you work in. Nearly all plastic processing equipment has to melt and convey plastics. Melt means high temperatures 250 to 800 °F (120 to 425 °C), convey, inject or extrude means high pressures. The minimum pressure of injection molding machines is usually about 16,000 psi and maximum can be 30,000 to 50,000 psi. Can these temperatures or pressures get to you? Interesting that the water pressure is 2,000 psi at the pipe break and the oil pressure is about 7,000 psi. What would happen if a hydraulic hose broke releasing 1,500 to 3,500 psi of warm oil? Is it possible for the 16,000 to 50,000 psi break loose and reach out and touch you? These temperatures and pressures produce so much force that if even if a fraction of it hits your body it is loss of a limb or life. Fact is it happens more often that you know. Ask some the processors if they have ever seen a hopper be blown off the feed throat into or even through the ceiling. Any pock marks in the ceiling of your plant? Any want to tell their story of when an end cap on nozzle blew off a barrel?

The following are a few points that I feel are important. Take this as a starting point, so email your suggestions. I will add them to this list and the updated version will be on my website www.ScientificMolding.com; look on the top row of topics and click on publications. Then download and discuss with your crew and coworkers. If you find any that are real for your work place, establish a plan of action....NOW.

General Operating and Plant Procedures:

1. Who is responsible for your safety? YOU are! Sure the company might have to pay the hospital bills etc. but it is too late by then, the point is to prevent you from getting hurt.
2. Does management allow *anybody* to tamper with or bypass safeties on the machines? If so, get your resume out and look for another job. Do not stay at this plant, it will be out of commission with in 2 – 3 years and everyone will be looking for a job.
3. Is there a designated meeting area in case of an evacuation? Is there a practice evacuation?
4. Is there a mechanism in place that will account for all those in the plant if any emergency does occur?
5. Send me your safety issues or pictures

Machines and Operation:

1. Realize most process equipment, injection molding machines for example, is top heavy. If it going to be moved, make sure all involved understand this and have made appropriate accommodations for lifting, Not fun to watch a machine flop over and smash its controller.
2. Is the machine kept clean and oil leaks managed? By the way upon installation of any new machine, install with an eye to make it easy to clean. Keep water lines etc off the floor so that it is easy to get a broom, vacuum cleaner wand or mop underneath. .
3. Do all the safeties work; are they checked periodically?
4. Are there visible bubbles or cuts in the hydraulic hoses, if so stop and replace immediately. These are often signs the hose is degraded and perhaps ready to fail. If a hose busts, there is the possibility that the hot oil sprays on you or the nearby machine barrel. The hot oil will knock you down with a thermal shock, the lose hose could whiplash and cause a sever injury. If the hot oil contacts a machines injection barrel the heaters may ignite it. If the oil catches fire there is a good chance the entire building will burn down. The oil is a huge fuel source and if it spreads the plastic will catch fire. Now you basically have something similar to napalm, something difficult to extinguish.
5. When installing a screw and check ring after cleaning or repair: Install screw assembly, but before you bolt on the end cap, bring the screw to it forward or zero position. Then insert a piece of solder, plastigage or silly putty on the screw tip and then bolt on the end cap. Now remove the end cap to make sure there is clearance of ~0.060” between the screw tip and the end cap by measuring the thickness of the solder etc. The screw tip should never touch the end cap.
6. As the barrel is brought forward to for the nozzle to mate with the sprue bushing, note if the injection unit moves up, down or sideways as it mates with the sprue bushing. If it does it is not aligned and you risk the possibility of a stream of molten high pressure plastic coming at you.
7. Are there platforms or safe means for working on machines or do workers climb on press to work on it?
8. Send me your safety issues.

Material Considerations:

1. Does you plant handle any fine particle powders such as colorants, fillers, or other additives. Often these are dangerous to you if inhaled and often contaminate bearings, oil etc on the machine.
2. Remember some polymers are not compatible, they react with one another. Slight traces of one catalyze the spontaneous degradation of the other. Often the degradation is to a gas which can build pressures the can blow the barrel apart, end cap off, or hopper to the roof in an instant. It is commonly know among experienced processors that Acetal and PVC are problematic. Most learned the hard way, by experience. This is not the right way to learn, people do get hurt. When changing over from one of these to the other, your best bet is to completely cleaning for the barrel and screw. Today, there are several new resins that must be recognized for this problem. Those that I know about are;
 - a. PVC and Acetal (POM)
 - b. PVC and a number of soft touch materials such as Santoprene
 - c. Acetal and a number of soft touch resins such as Santoprene
 - d. Alcryn and Santoprene and Acetal
 - e. Do I have any of these wrong or do you know of others?

Do not let the routine of work numb you to the safety factors involved. You have to be thinking about your work and of those around you. They like you may have some family problems and may not be focusing on the work at hand. The technology around us is constantly changing. We may not have the ability to predict every possibility, so keep you mind alert as you work. Your life and health are fragile, handle with care.

Again, please email me your safety suggestions or pictures. I will add them to this list and it will be available at www.ScientificMolding.com; publications tab on top header.

Comments and corrections welcome, Thank you:

John W. Bozzelli

10 September 2010: Addition from Lloyd Kerley:

One thing I thought of while reading your article is the safe handling and storage of aerosol cans. Every shop has several different kinds of chemicals that are delivered in aerosol cans. I have seen several of the “pock marks” you mentioned in the ceiling insulation from aerosol cans that were set on top of a drier or any other hot surface for an extended period of time. A couple of folks (Molder’s Choice for example) sell small racks that can be attached to the side of the machine to safely store aerosol cans.

Thanks again and God Bless!

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