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Snapping During Gas Welding

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ABSTRACT
Welding is a process used by many construction and manufacturing firms. Dating back to the ancient times, gas welding evolved from simple melting iron methods to more sophisticated forms and equipment that aid in safe and proper welding methods and processes. Major causes of snapping or popping are related to problems with the equipment used for welding. Gas restrictions relate to the major causes of snapping. These are backfire and flashbacks. All these problems can be solved if there are proper measures put into anticipating gas flow, thereby implementing interventions to prevent snapping or popping. A simple solution is for the worker or welder to properly work in identifying the needed process and components involved before starting the welding process. Doing so, can prevent harm, damage to people and property, and accidents.This would then make the workplace safer for everyone.

Keywords: **Acetylene (C2H2) is a fuel gas that cannot be compressed directly as it explodes at high pressures. ("Oxyacetylene or Gas welding", 2015)**
Oxyfuel Gas Welding Outfit refers to the equipment needed in the welding process.
Oxygen and Acetylene Cylinders are cylinders that come in various sizes and pressures that range from 2000-2640 PSI which are made of solid armor plate steel and contains oxygen that will be mixed with acetylene to make the flame.
Regulators serve the purpose of controlling the storage cylinder pressure so that the mixture of chemicals create the right amount of flame.
Backfire is defined as the momentary deterioration of the flame into the torch tip which causes snapping or popping.
Flashback is a momentary or sustained retrogression of the flame upstream of the mixer, usually in the torch or hoses ("Backfires, Flashbacks, and Flashback Arrestors," 2004).

I. INTRODUCTION

Welding has long been used since the ancient times. Since the Bronze Age, pieces of evidence of people from that time made efforts to put pressure welding joints together. From simple welding iron together to blacksmithing and welding by hammering, welding has developed to more advanced processes. Gas welding is a common process used to weld and cut metals. As the term itself suggests, it is a "process of construction that involves the use of gasses as well as oxygen to weld metals together" ("Gas Welding Process Explained," 2017). It was during the 1900s that gas welding was developed. It involved "production of oxygen and later the liquefying of air, along with the introduction of a blow pipe or torch in 1887 which helped the development of both welding and cutting" ("Welding History," n.d.). One of the most commonly used types of gas welding is the Oxyacetylene gas welding which uses a mixture of oxygen and acetylene that burns and turns into an intense flame, reaching to about 3,500 degrees centigrade. The flame melts the surface of the steel, which facilitates the welding process. This type of welding is commonly used for steel sheets, tubes, and plates. The figure below illustrates the equipment used for gas welding. It uses pressure gauge regulators, tanks containing oxygen and acetylene, a valve and torch where the flame comes out. The regulators control how much of the acetylene and oxygen are released from the tanks to create the kind of flame the welder needs to use.

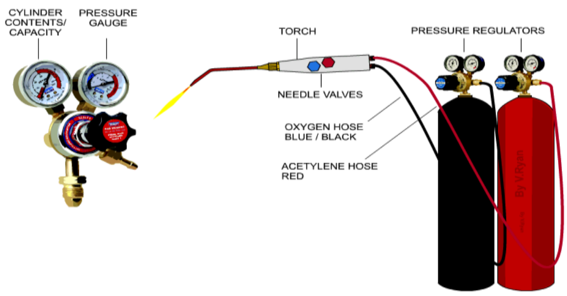

Figure 1: Gas Welding Equipment

From turning on the valves to turning it off, gas welding follows a process. Too much of one component in the gas used to create fire can create problems for the welder. Thus, it is important to make sure that the right amount is used in welding. Even with enough knowledge of the right mixture of gas and air, however, problems in gas welding can arise. As welding is a task which calls for an operator who has achieved a level of experience in the area, welding cannot simply be left to be done by workers who have not gained enough experience in the field. Statistically speaking, 16% of the causes of accidents are related to workers who have inadequate knowledge or skill, and 33% alarmingly related to unsafe process or improper procedure. The figure below illustrates a detailed information on the causes of accidents.

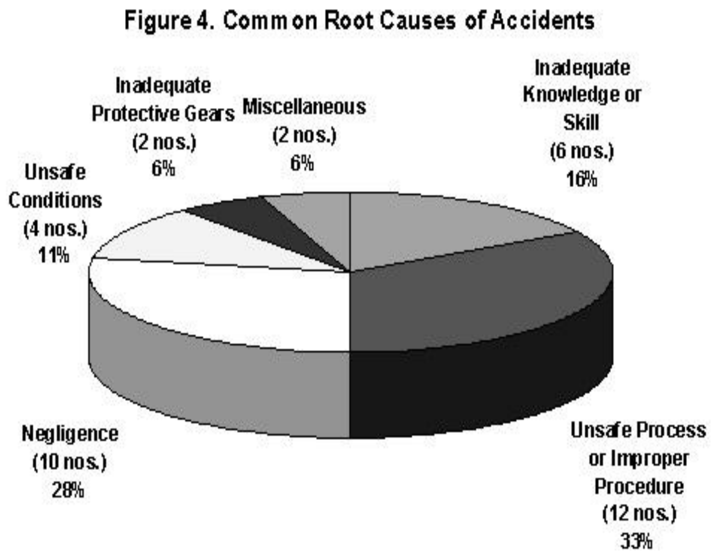

Figure 2: Causes of Accidents ("Welding Accidents," 2017)

In the recent years, measures have been taken to make sure that equipment follows safety standards for workers. Torches were designed as part of that safety measures, and while it is designed to do so, major flaws are heightened in incidences where accidents happen. Safety valves are secondarily placed in equipment to make sure that workers can monitor the amount of gas that is released before it is used. Nevertheless, there are incidences that cannot be avoided when working with welding equipment. Thus, this paper is interested in an examination of the causes and effects of snapping during gas welding and a discussion of developing gas welding.

Causes and Effects of Snapping During Gas Welding

Figure 3: A Welder working to bond joints together ("Welding Safety," n.d.)

Even if gas welding is a common practice in many construction and manufacturing industries incidents of snapping during gas welding still occurs and this is one that continues to be a dilemma for many skilled and experienced welders. One of the causes of snapping can be associated with gas welding is the unsafe amounts of gas pressure.“If there is more than 15 pounds of acetylene pressure being used, the gas becomes unstable and will explosively decompose”("Welding Safety", n.d.). Another cause is due to lighting the torch before a proper flow of fuel is properly set. These unsafe amounts of gas pressure can result in three effects: backfire and flashback. Backfire happens when oxygen in the cylinder is low or empty that causes the gasses to reverse flow. The high concentration of fuel can go up the oxygen line and mix with the gas inside which can result in explosions. Meanwhile, flashback happens when the flame goes into the torch and makes its way back to the supply system.So workers must know the right amount of pressure that needs to be used before welding.

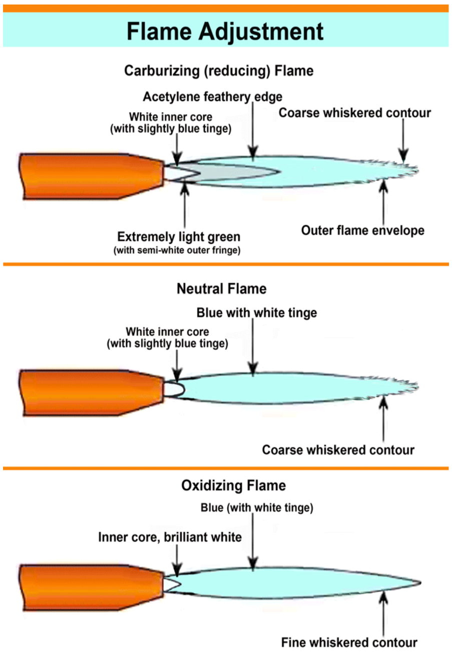

Figure 4: Flame Adjustment (Kay, 2016)

The illustration above shows a comparison of the different flames caused by the mix of gasses. Flame adjustment is a simple solution to prevent the snapping or popping of gas welding equipment. As can be observed from the picture above, the mixture of different gasses creates different types of flames, which can also affect the welding process and result in snapping or popping of the welding equipment.

II. DISCUSSION

Snapping is also backfiring and is a welding phenomenon where the welding flame suddenly goes out accompanied by a loud snap, hence the term. One of the primary dangers of snapping is that there is a chance the torch may suddenly light itself back up, but there is also the chance that it may not do so, in which case there is a need for urgent action for the oxygen valve to be quickly closed, after which there is also a need to close the gas valve. The backfire is also called a popping sound, or a snap, that is usually violent, and that is cause for concern for those who are not experienced in dealing with such snaps because of the potential danger associated with the violent activity (University of Pittsburgh; Afrox). A consequence of snapping or popping, for instance, is molten metal that can fly in different directions and cause physical harm to the welder and the people around. This requires immediate intervention in order to prevent and to stop snapping during welding. Among the causes of popping or snapping is the tip becoming overheated, the pressures of the gas being inappropriate or incorrect, the tip coming into contact with the weld, the tip being loose, or the seat being dirty (Autodesk). The literature further notes that backfires almost always come with snaps or also known as pops, and dirt at the end of the tip, or slag, may also cause the backfire phenomenon and the accompanying snap. This is not usually dangerous in and of itself, and shutting off the oxygen and the gas takes care of it, except that the snap, as discussed above, causes the splattering of molten materials, and this can cause physical harm (Integrated Publishing).

The literature further details backfiring and snapping during welding as being caused by a variety of factors and can occur for instance at the nozzle, where intermittent forms of snapping and backfiring can be attributed to low gas pressures that are set below the recommendations; the weld pool being touched by the flame's inner cone when the nozzle is placed in a way that is too close to the work being performed; when spatter in welding becomes accumulated, causing soot as well as scale on the nozzle part to lead to the blockage of gas from passing, and here one of the fundamental causes of backfiring and snapping can occur. The nozzle should be cleaned in this case with a probe and then with a cleaner that is apt for the dimensions of the nozzle entrance. On the other hand, when the nozzles are larger, backfires and snaps can occur when there is an overheating of the nozzle, causing the ignition of the gasses at the entrance of the nozzle. Here the use of cold water is ideal for cooling the nozzle entrance and preventing such overheating to occur, where the blowpipe continues to blow oxygen so that the water does not go into the blowpipe and the contraption remains water-free even as it cools down the nozzle to prevent snaps (Parkin and Flood 38-40).

Another way that the literature classifies different kinds of snapping and backfiring is to differentiate between ordinary snapping which is intermittent and generally not cause for much concern, likened to occasional slips that are relatively harmless if the overall process is snapping free, and more chronic kind of backfires that are sustained and are indeed cause for concern. In an ordinary backfire, the flame just goes out, and a snap or a pop is heard. In a sustained backfire, the flame burns back into torch inside, at the point of the mixer, and even further up the contraption, causing problems. In place of snapping, there is hissing, or squealing, or both, and the flame becomes associated with smoke as well as taking on a pointed and sharp quality. This is a dangerous kind of backfire, and the intervention required is for the user to right away turn off all of the torch valves so that serious harm is averted. If such continuous backfires are not mitigated, what happens is that the torch becomes permanently and seriously damaged, and fire can even ignite and engulf large sections of the surrounding area. Sustained backfires can be easily controlled and are often contained within the torches themselves, until such time that the welding torch valves can be turned off to stop the flow of the gasses. On the other hand, there are torches that are inherently flimsy and incapable of containing sustained backfires; and as a result, such backfires in such torches, resulting in the spewing of molten materials as well as fire as the backfire is sustained and the torches are unable to keep it within its own construction. In these cases, the flames breach the torches and so the entire cascade of dangerous effects as discussed above takes place (Gailey et al.).

The development of gas welding procedures to deal with snapping and backfiring requires that welders practice caution and become aware of the causes of snapping, as well as its consequences. Awareness of the causes of welding backfires and snaps alerts welders on what to watch out for when snapping incidents occur and what to do in order to prevent accidents and serious injuries from occurring. This means, likewise, an awareness of faults in welding and deficiencies in welding proficiencies that can be corrected in order to make the welding process seamless and injury free. The literature tells us moreover that backfires, when frequent, continuous, and insistent, are signs of poor welding practices and welders with poor technical skills. Obvious interventions to correct these deficiencies will go a long way towards addressing the safety and efficiency issues that are tied to snapping during the welding process (Gailey et al.).

To wit, backfiring is a phenomenon that has myriad causes, from pressure anomalies in the regulator and in the chambers, nozzle blocks that cause the nozzle to malfunction, nozzle use that is too close to the area that is being worked on and touching the pool, nozzles that become overheated, anomalies in the nozzle sizes that lead to inappropriate application of the nozzles to the area being worked on, and the like. Gas flows that are inappropriate and inconsistent with the work being done likewise can lead to backfires and snapping during the welding process. Having knowledge of the causes of the snapping, as discussed above, it becomes easier for the welder to correct the mistakes and to address the root causes of the backfiring. Knowledge of this also enables the welder to act fast and with presence of mind whenever snapping incidents during the welding process becomes chronic and non-stop. The procedures that are set in place likewise begin to make more sense once a welder understands how a procedural step is in keeping with making sure that the mistakes in the welding process are corrected having in mind what the underlying causes of the snapping are (Gailey et al.).

III. RECOMMENDATIONS

In general, the causes of the snaps should be identified, and the proper interventions should be put in place so that the snapping does not cause problems and that the backfire is averted and solved. Where welding is accompanied by constant snapping, there is the indication that the welder does not have the right experience and that the workplace is less secure from accidents that can cause serious harm and even death to workers. The welder needs to be better trained. Moreover, there are forms of snapping that are indicative of something chronic or persistent, as in the case of persistent backfires. Persistent backfires need to be addressed immediately and with high priority, because they can be very dangerous if left unchecked. Persistent backfires or snaps can resemble automatic gunfire in staccato bursts that occur at the tip of the weld contraption, accompanied by the flames going out and the blowpipes emitting squeals that are of a very high pitch. Here the blowpipe is in danger of serious damage because what is happening is that gasses in the blowpipe are ignited from shank flashback. This phenomenon is corollary to the main phenomenon of backfire that causes snapping during the welding process but is important to discuss here (Parkin and Flood, 38-40).

There are procedures that can be followed to make sure that backfires during welding that cause snapping are mitigated and addressed properly. These procedural recommendations extend through the entire welding process and can be construed as best practices that promote safety, and that can be followed and taken to heart as essential practices. The procedure for lighting, for instance, takes into account the proper use of lighting torches for safety. The procedure includes making sure that nozzle sizes are appropriate for the work, and so are the regulators. Regulator pressures are checked for appropriateness to the nature of the work as well. The ignition source is kept at a distance from the nozzle until such point that the flow of the gas fuel is established and fluid and such ignition sources include smoldering tows, pilot lights, and the like. If the flame goes out in snaps from backfires, while the torch is in operation, the potential reasons for such are to be considered, and the interventions standardized. The potential reasons for the snapping are incorrect regulator pressures, incorrect gas flows, blockage in the nozzle, a nozzle in proximity to the work being done, and an overheating nozzle. In the event of snapping, the torch valves are closed, the cylinder and regulator pressures are reviewed, and the torch is relit using the procedures that have been laid out above. In the case of an overheating nozzle, on the other hand, the recommendation is the use of cold water as a water bath for the nozzle, into which the nozzle is plunged while at the same time keeping the oxygen valve in operation and the oxygen flowing to keep the water from entering the nozzle and the rest of the welding contraption. In this way, snapping during welding is averted and mitigated. In the long run, too, such procedures can constitute a kind of training on the job for welders, so they become more proficient undertaking the work as a routine, under best practices procedures (Afrox).

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