PHILOSOPHY OF EXPLOSION PROTECTION.

After having to sit through a tender meeting and listen to venders and the client arguing over what exactly the client required I felt so appalled at the volume of misconceptions that I had to express my understanding of explosion prevention. I hope you find it of value and that it wil clear rather than further deepening some of the chaos around explosion prevention.

First of all when I talk about explosion prevention I have no concern with fire protection, for all I care a fire will peacefully burn the plant to the ground and hopefully not cause an explosion. Explosions happen where there is a buildup of a fuel and oxygen (air) mixture that if ignited would rapidly oxidize and cause a shockwave of expanding gasses. This shockwave wil cause the pressure to increase so destroying any obstructions. So as you surely know an explosion can be much less romantic than just a fire even though both can cause devastation in a plant. On that note we are also not concerned about explosives despite the resemblance. Explosives carry the oxygen they need in their composition and therefore don't necessary need additional oxygen, only an ignition.

If one were for example to take a piece of charcoal and ignite it, it wil surely burn from the outside to the inside oxidizing all the fuel over a few minutes, now take the same mass of charcoal pulverize and suspend it, if this were to be ignited the entire mass will rapidly be oxidized leading to the gasification of the fuel and rapid expansion of gasses thus causing not a fire but a explosion as describes before.

So the first step in explosion prevention would be to determine where these explosive atmospheres can or is likely to form. They can be highly unpredictable so therefore a thorough study of the plant needs to be done the results should be captured in the form of a Area Classification report to go with a AC Drawing that will indicate graphically where the explosive atmospheres or Zones are. The Zones are divided into three ranging from Zone 0 to Zone 2 (for gases; another 3-Zone structure applies to dusts). The different Zones wil indicate how often the explosive atmosphere is present with Zone 0 being constantly and Zone 2 only under abnormal conditions, there is a popular believe that the Zone 0 is "more explosive" than a Zone 2 this however is not the case. Remember that the Zones wil indicate where a fuel and oxygen mixture forms and its frequency but if you had an ignition of a explosive atmosphere the result is expected to be similar, therefore the more severe Zones only indicates how often a possible ignition can be tolerated not how explosive the atmosphere is.

After the size and frequency of the explosive atmospheres was determined the next step wil be to remove all the possible ignition sources. This can be a real challenge as we know, any process plant needs electrical equipment and control instrumentation and they can all be potential ignition sources. Lets start by discussing how ignitions can happen, first of all a ignition source need to add enough energy to the fuel/oxygen mixture to start to bond or oxidize, this wil lead to a exothermic reaction that wil in turn sustain the process and cause the entire mixture oxidize. The two main ignition sources are by a hot surface or by an electrical spark (with enough energy). Since the days of a Canary in a cage(or some other poor creature) more effective techniques were develop to protect equipment from becoming potential ignition sources these are tested against safety standers designed for each technique. The tests area carried out by the approved test laboratories (ATL's).

The ATL conduct the range of specified tests on equipment to determine if they can cause a ignition and what the chances of a ignition is, the protection techniques is therefore only suitable for certain Zones depending on how secure they are. The tests are recorded in a Test Report and a Type Certificate is issued to indicate what type of explosion protection was used and what special precaution have to be taken additionally. The Test Report is normally not supplied to the end user but the equipment has to be accompanied by the Type Certificate and properly filed. An audit of equipment installed in explosive atmosphere (Zoned areas) should therefore also be done at least every two years.

The next point is on a document referred to as a Certificate of Conformance or COC this is issued by a specialized electrician or MIE to indicate if the plant is safe to operate. He not only looks at

the explosion protection but also has to consider a wide range of safety factors of which explosion prevention. The MIE is therefore not necessarily involved with the area classification or the explosion protected equipment audit but wil have to consider weather it is in place before the COC can be issued.

Lastly training has to be provided to the people working on the plant so as to ensure they maintain the protection of the equipment and therefore need to be able to read and understand the area classification and at least now the different protection methods applied to the electrical equipment.

The complete process is summarized in the diagram provided.

I hope this document provided some insight into how explosion prevention is done and remember, don't over complicate anything that is the recipe for faults to occur.

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