

**GAS SAFETY UK      CLIENT UPDATE FOR SUMMER 2002  
FLASHBACK ARRESTORS, ETC.**

1. From The Worksop Guardian (26.04.02) 'Man Hurt in Blyth Explosion'

'Exploding gas cylinders left a Blyth man with serious burns as his house caught fire yesterday morning. Details of the blaze on Bawtry Road were still unclear as the Guardian went to press yesterday, but one eyewitness said the blasts were huge. "I just came out of my house and heard a massive explosion," said neighbour Pete Henry, who was first at the scene. "I looked towards the sound and all I saw was a huge ball of flames and lots of smoke."

Mr Henry said he called the fire brigade on his mobile phone and met the victim of the fire coming down the street.

According to police, the man, who has not been named, was taken by ambulance to Doncaster Royal Infirmary.

Neighbours said that several gas cylinders were stored in a shed at the rear of the house. It is believed that there were a total of 12 explosions and around 10 houses were evacuated.

"It looks like my garage has probably gone up as well," said next door neighbour Ged Gauntley. "I had several motorbikes in that garage, and I also had a aviary full of birds that has been burned."

At the height of the fire 10 appliances from Tuxford, Retford, Harworth & Worksop were battling the flames. Fire fighters were still at the scene yesterday afternoon carrying out investigations.'

*No laughing matter by any stretch of the imagination. Although I have joked about folk who fetch cylinders home from work and although the cause of the fire (even at the time of writing this piece) remains unclear, we [all] know that gas cylinders in fires are a bad thing.*

*Although it is [statistically] likely that this fire was caused by Hot Work (a bit of gas welding or cutting) going wrong, it has also been known for many years that a flame front travelling back along a hose or tube to the gas supply can cause carnage and disaster. Hence, it seemed appropriate to devote a little time and effort to explaining what flashbacks are and, more importantly, how they can be prevented.*

## **2. FLASHBACKS, ARRESTORS AND ASSOCIATED SAFETY ISSUES.**

### **NOTES:**

(a) Traditionally, the fitting of flashback arrestors and non-return valves is associated with oxy/acetylene, etc. use (gas welding, flame cutting & allied processes).

(b) Flashback arrestors (FBA's) and non-return valves (NRV's) have an essential safety role to play in applications that are outwith these 'traditional' processes.

(c) FBA's & NRV's are often integral in the development of a safe system of work [gas usage] in many modern/technical situations.

(d) When systems, experimental rigs, etc. are being designed it is, of course, essential that the possibility of flashback as a hazard is considered in the initial Risk Assessment. As, when & if a flashback is a possibility with it's attendant 'risk', then measures must be implemented to eliminate the danger at source or to reduce both the likelihood and impact of the flashback to levels that are 'acceptable.' Low incidence - high consequence?!

(e) Unfortunately, it is not always possible to remove the danger at source (e.g. by substitution with a non-flammable or potentially non-explosive gas or gas mixture).

(f) Operating procedures are [safety] critical in avoiding flashbacks - for example, by purging into, and out of, service thereby avoiding the formation of an explosive mixture; especially alongside actual [or potential] sources of ignition! A flame isn't the only thing that can/could/does cause ignition - hydrogen in the worst case scenario has an ignition energy of around 20 microJoules. Hence, earthing, static charging, the proximity of electrical systems (switches, motors, lighting, etc.) may, in some cases, have to be considered - this, clearly, is why the detector head for our hydrogen gas monitor has to be made 'intrinsically' safe.

(g) The selection, care, maintenance and assembly of the gas control and supply components, is, of course critical - in some situations it may be envisaged that if the fuel gas could leak out at positive operating pressures then, perhaps, air could leak back into the system should the operating pressure be dropped to atmospheric. Leak paths are potential flux paths. See previous Technical Note on Purging.

(h) Don't get paranoid, just get careful and, of course, if you're not sure - then just ask; a few moments spent in finding out could be time that has been very well spent.

## **FBA'S - FUNCTIONS, FACTS & FIGURES**

**\* A FLASHBACK ARRESTOR IS A DEVICE THAT HAS BEEN DESIGNED AND CONSTRUCTED TO EXTINGUISH OR DISSIPATE A FLAME FRONT [DETONATION] THAT TRAVELS IN THE OPPOSITE DIRECTION TO NORMAL GAS FLOW: i.e. upstream towards supply and, God forbid, through the regulating valve and into the cylinder or vessel.**

**\*\*FBA'S SHALL BE DESIGNED & LABELLED FOR THE SERVICE GAS (E.G. HYDROGEN), IDENTIFIED WITH A PRESSURE RATING TO MATCH OR EXCEED THE MAXIMUM OUTPUT PRESSURE OF THE REGULATOR TO WHICH THEY ARE FITTED (E.G. 4 BARG) & HAVE AN APPROPRIATE STANDARD NUMBER (E.G. IN THE U.K., EN730 TENDS TO BE USED FOR CYLINDER SUPPLIED SYSTEMS). AS THESE FBA UNITS ALSO ACT AS NRV'S, THEY OFTEN CARRY AN ARROW THAT INDICATES THE DIRECTION OF FLOW SO THAT THEY AREN'T INSTALLED UPSIDE DOWN!**

**\*\*\*WITH THE OBVIOUS EXCEPTIONS OF HIGH PRESSURE, HIGH FLOW, PIPELINE APPLICATIONS, SUCH FBA'S AS THOSE OUTLINED ABOVE ARE, BROADLY, AVAILABLE IN TWO TYPES:**

- 1. RESETTABLE &**
- 2. AUTOMATIC (OR NON-RESETTABLE)**

**N.B. Those that can be 're-set' tend to be more expensive as they have greater functionality. The 'automatic' types are less expensive but this comes about by sacrificing the 'thermally activated cut off device' that features in the type that may be 're-set'.**

Further to previous 'Update' notes, please bear in mind that the thermally activated cut off valve, featured in the re-set type of FBA, is designed to trip off in the event of ambient temperature rising to ~100 degrees C. A fire in the vicinity could activate this shut down. This benefit cannot be derived from the automatic type of FBA; these are purely designed to deal with internal flame excursions.

In both cases, FBA's extinguish internal flame fronts via a sintered element. These are manufactured from stainless steel and they look like dense, tubular filters. In the event of a detonation flame front entering the FBA, the flame runs up/around/against this sintered element and is dissipated by the flame entering the small pores within the sintered element. Much like the principle behind the Miner's Safety Lamp where a gauze protects the flame from an explosive mixture on the outside. The pressure change that accompanies the detonation is also absorbed but is translated through the device and actuates a pressure switch. This, in turn, causes a valve to close. Usually, this valve prevents gas from the supply entering the unit. Finally (in the re-set type) the thermally activated valve is closed by the temperature increase. In some automatic types of FBA, a fusible unit melts at this point and the FBA is sealed off; such a unit would then have to be disposed of.

The maintenance requirements for FBA's are minimal. Annual inspection and test are recommended and, in line with the replacement interval for brass regulators in non-corrosive service, all FBA's should be routinely exchanged for new every 5 years.

Flashbacks should not be confused with flame snap-out or back-firing: these are problems associated with gas exiting velocity and an imbalance with the speed at which the gas burns. Flashbacks could occur in any fuel gas system but they are most likely when two gases are mixed together (a fuel and an oxidant) and the mixture is then ignited. In the technical environment then, a flashback to hydrogen cylinder on a hydrogenator is plausible and flashback affecting acetylene/nitrous oxide on an atomic absorption spectrophotometer should be taken very seriously. When gases are mixed, FBA protection must be applied to both 'sides' of the system and non-return valves at the outlet to the application/machine should be installed to prevent backfeeding, pre-mixing and the formation of an explosive mixture.

Prices and part numbers for FBA's are available in the catalogue: visit [www.gas-safety.uk.com](http://www.gas-safety.uk.com) or contact: [sales@bj-industries.co.uk](mailto:sales@bj-industries.co.uk) to request a copy by post.

Best regards to all, David Bayliss.

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