

Dr Hal @ ASE 2013

Exploding ostrich egg

Risk Assessment

Please note that this risk assessment was written to cover the demonstration of this experiment at the ASE Conference in January 2013. For any other use, this risk assessment should be reviewed to see whether there is a need to modify or adapt it in any way to suit the particular conditions under which the experiment will be carried out.

Risk Assessment: Professor Hal Sosabowski

Written By: **Professor Hal Sosabowski**

Location: University of Reading

Date Of Assessment: 30th October 2012

ACTIVITY

RISK CATEGORY	DESCRIPTION OF ACTIVITY TO BE ASSESSED
Low	6 th Jan 2013 Exploding Ostrich egg

HAZARDS

List hazards here. List only hazards which could reasonably be expected to result in significant harm under the conditions in your workplace.

Exploding Ostrich Egg / Chicken egg

Description: ostrich egg is emptied of it's contents and vent hole drilled at the top and bottom. Hal and co-presenter fill an empty egg with hydrogen gas from the bottom vent, ensuring all the air is displaced. They place egg on a retort holder, which has twin safety screens front and back (or single extra thick polycarbonate screens) and then lights the hydrogen at the vent at the top of the egg (at this point a wire mesh guard is placed on top of safety shields). The egressing hydrogen ignites, and initially burns with a yellow flame due to the low oxygen tension inside the egg. As the hydrogen burns, it sucks air through the bottom home of the egg. This raises the oxygen tension inside the egg until the significant H₂:O₂ ratio is achieved, whereby the mixture becomes explosive and at which point a explosion occurs shattering the egg with a flame. The safety shields front and back of the eggs stop the sizable pieces of egg from impacting the operators, audience and any local operatives.

Hazards:

1. Hazard from explosion/flying eggshell;
2. Sound hazard to hearing from large percussive bang;
3. Fire hazard from hydrogen flame;
4. Safety shield being blown over;
5. General hazard of hydrogen gas igniting;
6. egg exploding prematurely.
7. Hydrogen/compressed gas cylinder

WHO MAY BE HARMED

List here groups of people who are especially at hazard from the hazards that you have identified. You may list individuals but think of groups of people doing similar work

1. All operatives in vicinity of experiment/audience.

RISK ASSESSMENT

List existing precautions & controls here or note where information can be found

General:

- (i) Dr Hal Sosabowski/Dave Campbell will have carried out demonstration previously and will oversee, direct and carry out the experiment;
- (ii) Experiment demonstrated and explained by Hal to satisfaction of all;
- (iii) Hal/Co-presenter to wear safety glasses, ear defenders, Hal and Co-presenter to wear laboratory coats at all times during demonstration, local crew to wear safety glasses and ear defenders.
- (iv) Audience clearly warned not to attempt to emulate the experiment in any form especially lighting gases (audience are unlikely to be able to obtain hydrogen since is not widely available and where it is various restrictions carried out on its sale).

1. Explosion/flying eggshell:

- Hal/co-presenters/ local crew to wear safety glasses, ear defenders and Hal/Co-presenters to wear laboratory coats at all times during demonstration, Lab local crew to wear glasses and ear defenders. The experiment will be surrounded by a pair of safety screens; front and back, the inner pair move with the explosion, the outer pair are fixed to the table.
- local crew in particular counselled re the temptation to move much closer to the apparently benign egg once it has been lit (although there will be a safety shield in place) – there will be a small flame at the top hole initially but it **will** explode without warning about 20-30 seconds after first being lit.
- Hal/co-presenters to stand well away during burn time.
- Any eggshell egressing the top of the screens will be caught by a mesh which allows the explosion front through but which will catch any particulates above the mesh size.

2. Large percussive bang:

- All present warned to expect large bang; the ostrich egg has been tested by Dr Hal and makes 126 dB_A at 3 metres over 0.5 seconds this is within the Noise at Work regulations for a single dose.
- All individuals on stage to wear CE-marked ear defenders. Audience warned to block their ears and expect a loud bang.

3. Hydrogen flame:

- All combustibles moved away from area.
- Hal/Dave C to move well away from shielded apparatus.
- See note in **1(ii)** re local crew.

4. Safety Shield:

- See note in **1 (i)**.

5. Hydrogen gas:

- All sources of combustion removed from Lab table. Hal to warn when he is about to commence charging the egg with hydrogen. Hydrogen cylinder to be deployed as late as possible before and removed as early as possible afterward.

6. Hazard to Hal's hand in the event of egg exploding prematurely:

- The egg will explode prematurely if it hasn't been flushed free of air with great force, shrapnel and flame. The egg must therefore be **fully** charged with a strong flow of hydrogen for 60 seconds. This will take as long as it takes and mustn't be rushed. Hal will time this. The hydrogen flow and slight leakage will create its own (manageable) hazard (see **5**). Hal will also use a taper attached to a dowel, but will be restricted in terms of distance he can get from the egg since he must light it soon after removing finger from the vent hole. Past experience has shown that a gas lighter can be used to the safe effect safety-wise. Therefore the chain of events should be practiced several times to ensure everything is done competently and in the correct order.

7. Hydrogen compressed gas cylinder

Hydrogen cylinder provided by BOC. Hydrogen regulator used, fitted and controlled by D. Campbell –trained in gas cylinder/gas regulator handling. Gas cylinder(s) to be held in safety stands. D. Campbell to oversee the storage and use of cylinders at all times. DATA sheet to be available (with this assessment)

WHAT FURTHER ACTION IS NECESSARY

List all hazards that are not adequately controlled and the action that you will take, where it is practicable, to do more

None

Have all necessary precautions and procedures been included in the assessment?
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Yes

RESULT - T=Trivial Hazard /A=Adequately controlled

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