Fire Breathing Safety

MIT Spinning Arts Club

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1 Introduction to Fire Breathing/Basic Terminology

Fire breathing is the art of expelling fuel from your mouth in a fine mist over an open flame in order to produce a large puff of fire. When done correctly, it can look cool while minimizing risk to yourself and others. That being said, fire breathing is inherently dangerous, and the following guide will only give you tips on minimizing risk, not mitigating it all together.

This document is meant to serve as a collection of notes to help you remember the safety lectures, not as a how-to. Before fire breathing for the first time, make sure that you have had in-person instruction, ample practice with water, and have gotten the okay from a fire breathing trainer.

Prop. Performance items whose wicks dipped in fuel and spun.

Lit Prop. A prop on fire.

Fuel. The fuel used for fire spinning props is Coleman Camp Fuel. The fuel used for fire breathing effects is Lamplight Farms UltraPure Lamp Oil.

Safety Blanket. Used to put out small fires. Usually, thick cotton cloth (Duvetyne) cut into approximately 2’ by 3’ squares. Chemically treated with fire retardant.
Spinner/Fire Spinner. The person manipulating the prop.

Safety/Designated Safety. Person designated with helping the spinner remain safe.

Double Bucket System. The fuel containment system, which consists of a metal paint can inside of a plastic 5-gallon bucket.

Fueling Station. The area in which fuel is kept and props are fueled before burning.

Spin-Off/Spinning Off. The process by which excess fuel is removed from a prop before or immediately after lighting the prop.

Burn Field The area where spinners manipulate props that are on fire or fire-breathe.

2 Fire-breathing fuel

2.1 What to Use (and why we use it)

The fuel that the MIT Spinning Arts Club uses for fire breathing is Lamplight Farms Ultra-Pure Lamp Oil. It is a paraffin lamp oil, a clear, oily liquid with a slight hydrocarbon odor. Here is a link to the MSDS for Ultra-Pure Lamp Oil:

http://www.nafaa.org/ultra-pure.pdf

The term “paraffin” describes the set of all linear alkanes, of which around C₆–C₁₆-ish are liquid. The paraffins used in the Ultra-Pure Lamp Oil are therefore a subset of these, and the “Ultra-Pure” designation means that the fuel is only allowed to have a small percentage of impurities in it, as opposed to the Medal-lion types which will have slightly higher impurity thresholds. This fuel is safer to use (compared to other common fuels) for several reasons:

It has a high flash point. Fuels with higher flash points are safer to use because they are less likely to ignite when you’re not expecting them to. Paraffin has a flash point of greater than 90 °C, whereas the white gas normally used for prop spinning use has a flash point of less than 0 °C.

Paraffin itself is not very flammable. Since the flash point of paraffin is so high, the fuel does not burn easily near room temperature, requiring sustained application of heat and flame to ignite.

Paraffin is relatively inert and therefore not very carcinogenic. Since all the hydrocarbon chains are satu-rated, they tend to react less with your body than do unsaturated chains.

This is the only type of fuel the MIT Spinning Arts Club uses for fire breathing.

2.2 What Not to Use (and why not to use it)

These are all fuels that are used for fire breathing in other places with semi-regularity. These fuels are unsuitable for fire breathing for a variety of reasons, some of which are detailed below. In general, if confronted with an unfamiliar fuel, do some research and look at the MSDS sheets.

Coleman Camp Fuel. Also known as white gas, we generally use this for burning props because it lights easily and burns with a clean and bright flame. Breathing with it, however, is not a good idea because of the aforementioned low flash point. Additionally, it can contain large amounts of benzene and other carcinogenic additives, which will get absorbed into your body through the tissues in your mouth.
**Alcohol**  All the absorbent tissue in your mouth will absorb the alcohol and get you drunk, even if you don’t swallow it. It is a very bad idea to breathe or do any activities with fire while intoxicated. More importantly, the alcohol acts as a local anesthetic, which means that it will numb your mouth and the surrounding areas so that your body can’t feel as quickly if something does go awry. It also has a very low flash point.

**Cornstarch.** Cornstarch is not toxic or carcinogenic, but since the particles in cornstarch are so small, you’re at a much greater risk of inhaling it, leading to lung irritation.

### 2.3 Carrying Fuel while Breathing

When on the fire breathing field, the fuel should be in a plastic bottle with an easy access cap. This allows you to easily uncap the bottle before every mouthful, and recap it immediately afterwards.  
Uncapped bottles of lamp oil can spill and be fire hazards on the field.  
If you put fuel in a plastic bottle, label it with something like "FUEL: DO NOT DRINK" so that others do not confuse it with potable beverages.

### 3 Safety Procedures

Many aspects of this section were covered in the Basic Fire Safety Training but these guidelines are important so they bear repeating.

#### 3.1 What to Wear

1. **Natural fibers, like wool and cotton.** Synthetics (e.g., polyester, nylon, etc.) will melt instead of burn, and exacerbate potential injuries.

2. **A hat, if your hair is long or unwieldy.** In case your prop goes near your hair, a hat will protect it from burning. (The hat should be made of natural fibers as well.)

3. **Eye protection** can be useful, but is more a matter of personal preference.

3. Wipe rags should be used to wipe away excess paraffin after every breath. Wipe rags should be made out of natural fibers and kept out of the vicinity of the flames.

#### 3.2 Sobriety

Sobriety is important for all fire arts. When fire breathing, it is important to retain alertness in order to be able to react to unexpected changes in conditions. Also, alcohol has a slight anesthetic effect, which means that you won’t feel pain when you should be feeling pain, and might not realize when something’s wrong.

*No one will be allowed to breathe fire or spin fire props under the influence of any drug, including alcohol, at an event organized by the MIT Spinning Arts Club.*

#### 3.3 Fire Blankets

Fire Blankets are used both to put out the performer if they catch on fire and to extinguish the prop (in this case a torch) after the performer is finished breathing. Many fire blankets are made out of a material called duvetyne, which is made of cotton and treated with flame retardant. Since the actual cloth isn’t flame retardant, if you accidentally get the duvetyne wet, the flame retardant will wash off and the blanket will no longer be suitable for use as a fire blanket. In such a case, throw it out immediately.
Also, if a fire blanket becomes soaked in fuel, dispose of it accordingly.

There are other types of fire blanket that are actually made of flame retardant material, such as panther felt. Feel free to use these, when safetying out props with a lot of fuel.

What you can also do if you don’t have a safety blanket (or if it’s wet outside) is to use a wet towel (make sure it’s cotton, not synthetic!), which works just as well as a duvetyne.

### 3.4 Wind

If you’re breathing outdoors, wind will always be a factor. Since fire breathing requires you to create a fine mist of paraffin, you must always be cautious of where the wind is blowing as you are breathing. Do not breathe into the wind. Also watch where the wind carries clouds of unlit paraffin so that you don’t breathe it in. If the wind is too strong, or changes direction often, breathing will not be allowed.

**Whether or not fire breathing is going to happen on a certain night is up to the discretion of the fire breathing trainer. Do not breathe without consulting them first.**

### 3.5 Fire Breathing Hazards

What follows is a list of potential fire breathing hazards, and how to mitigate them. It is important to keep these risks in mind when breathing, although with proper breathing and safety procedures most of these risks can be effectively mitigated.

**Swallowing Fuel** Swallowing tiny amounts of fuel is okay (and you will definitely swallow at least some when you breathe), although it will probably have a slight laxative effect and make your stomach feel funny for a while. Swallowing larger amounts will probably give you diarrhea and possibly cause stomach ulcers.

**Skin Irritation** If left in contact with your skin for extended periods of time, lamp oil can cause skin irritation. Changing clothing and wiping your face/neck/chest with baby wipes after breathing can help prevent this.

**Blowback** Watching the direction of the wind as you breathe is important to keep the fuel from blowing back in your face, which poses risk of inhalation and burning your face. Don’t breathe into the wind, and watch for sudden wind shifts that could carry lit or unlit fuel to places you don’t intend.

**Chemical Pneumonia** If you inhale a substantial amount of paraffin, your lungs will attempt to flush out these substances by flooding themselves with more fluids. The symptoms can range from mild and flu-like to life-threatening. In most cases, the flu-like symptoms will be gone within the next day. In the much less likely event that the symptoms persist for more than one day or you feel very ill, you should visit a nearby hospital. It is important to note that chemical pneumonia is different from bacterial pneumonia. One of the big differences between the two is that chemical pneumonia is not actually medically treatable with antibiotics, since it is not caused by a bacterial infection. If you ever have to go to the hospital for this, it’s rare enough that doctors will often have trouble diagnosing it, so make sure you explain what happened (having someone along to explain the situation would help).

**Too Much Breathing** During the course of a night, you will inevitably swallow some paraffin and inhale some paraffin, just because it’s there. Therefore, it’s important to take breaks every few minutes and also limit yourself to a certain amount of breathing per night. Otherwise, even if you do everything right, you can still feel sick and dizzy afterwards because your body has been in contact with so much paraffin.
Fire breathing trainers will be watching to prevent you from breathing more than your body can handle. If a fire breathing trainer approaches you for this reason, stop breathing.

**Bystanders**  Breathers aren’t the only ones who have to watch out for these fuel hazards. Anyone standing around breathers should also be conscious of these risks, and act accordingly. Fire breathers should also breathe in a way that minimizes contact with bystanders. Safeties, especially, should take care to do these things.

*Fire breathers will have their own designated area for fire breathing to minimize risk to other spinners. No-one will be allowed to breathe outside of this area.*

### 3.6 Safetying Fire Breathers

Every fire breather must have a dedicated safety before fire breathing. If breathers do not have an approved safety, they will not be allowed to breathe. Here are some notes on safetying fire breathers, which are meant to supplement the club’s practical training sessions:

1. In most situations (always, if the breather or safety is a beginner), the safety should be standing behind their breather’s shoulder on the side that the torch is not on, close enough to reach out and touch their shoulder. The safety should be paying attention at all times and holding the blanket in their hands.

2. Safeties should help their breathers keep track of wind direction. If the safety feels that the breather should not be taking that particular breath in that particular direction at that time, they should notify their breather.

3. Verbal signals between breather and safety are good. The breather should use hand gesture to indicate the direction of their breath.

4. Smother the fuel, don’t pat at it.

5. If there is lit fuel on the breather’s face, wipe away from the eyes and nose.

6. In case of incidents, call (617) 253-1212 (MIT Police) and notify the nearest trainer.

### 3.7 Emergency response

In case of emergency:

1. Contact trainer

2. Call (617) 253-1212 (MIT Police), not 911

3. Administer first aid