Building a Safer Butane Hash Oil Extraction Facility

An Industrial Hygiene Perspective

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Maybe you are an ambitious new entrepreneur. Medical marijuana is now legal in your state. Maybe even recreational marijuana is legal. You have just purchased a shiny new butane closed-loop extraction system and that system may have received an engineer's review as being safe. You have a stock of trim or premium bud to process. You are going to make thousands of dollars of hash oil, shatter, or budder every day. You are ready to go, right? Wrong.

In the states of Colorado and Washington, the use of closed-loop systems that recover butane and prevent it from being released to the environment are the only systems that meet regulatory standards. Although a closed-loop system by itself significantly reduces risks to operators, the installation and operation of such systems can also result in serious hazards. This brochure is intended to look at some techniques that have been used to reduce the hazards of use of these systems in buildings.

SOME FACTORS FOR CONSIDERATION

- *Room Dilution Ventilation*
- *Fire and Life Safety Systems*
- *Airflow Pathways, Exchange Rates, and Velocities*
- *Local Area Exhaust Ventilation*
- *Interior and Exterior Storage of Flammable Solvents*
- *Ignition Source Control*
- *Flammable Gas Monitoring*
- *Training*
- *Personal Protective Equipment*
- *Hazardous Materials Management*
- *Sanitation*
- *Fire and Emergency Management*

Developing a safer installation can be a complex task, with a number of factors to consider.

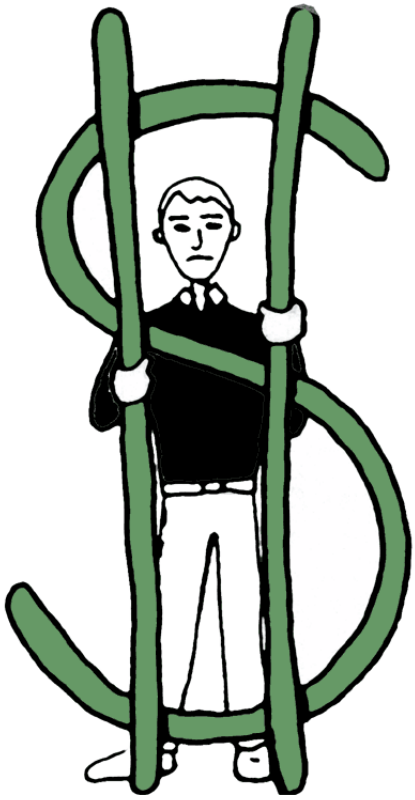
Many of these measures are part of a belt-and-suspenders system – so that if your belt fails, your suspenders are still there to keep you from getting embarrassed. Only with butane you risk more than embarrassment – your life or your employee's lives are on the line.

In the United States, the chemical process industry has an excellent safety history. Operating a butane closed-loop system is a complex industrial process. If you start up your system without addressing the installation safety hazards, you are not going to get close to the existing industry safety experience. You are likely to get shut down by some regulator from any one of the many agencies looking over your shoulder. To be not only the ambitious entrepreneur, but the successful one, you need not only to pay attention to safety and compliance, you have to plan for it.

In 2015 the U.S. Occupational Health and Safety Administration (OSHA) started taking a close look at these systems after a closed-loop system explosion nearly killed two operators. Safety standards have become more stringent since the first edition of this booklet.

I COST CONSIDERATIONS – PROPER INSTALLATION CAN BE EXPENSIVE

The proper installation of a closed-loop hash oil extraction system ("CL System") can be expensive and time-consuming. When the costs of a properly installing a CL System for safer operation are counted up, those costs can easily exceed the costs of the extraction system itself.



This document is not intended to assess the function, safety, or engineering of any particular closed-loop hash oil extraction system. Rather, it is intended to inform users of the installation and use of such systems in industrial or commercial operations in a manner that may reduce risk.

COST FACTORS TO CONSIDER WHEN SETTING UP A CLOSED-LOOP BUTANE EXTRACTION SYSTEM

- *Explosion-proof equipment and facilities*
- *Purchase and installation of a proper ventilation system*
- *Updating and improving room layout*
- *Finishing room flooring, walls, and ceilings with cleanable surfaces*
- *Certified Industrial Hygienist or Professional Engineer review and support*
- *Training program development and implementation*
- *Sparkless Tools*
- *Electrical upgrades*
- *Reduction of spark and ignition hazards*
- *Flammable Gas Detection Instruments*
- *Signage*
- *Personal Protective Equipment*
- *Butane Storage Cages*
- *Sprinkler System Installation*
- *Fire Extinguisher Purchase & Maintenance*

II VENTILATION – REMOVING FLAMMABLE GAS

A Closed-Loop Butane Extraction System ("CL System") can capture most of the butane used to extract hash oil. Some butane will escape. Loose fittings, cracks in tubing, operator error, or even emptying spent trim from the extraction vessel will cause some butane to escape. The Closed-Loop System itself is significantly safer than open blasting as it is intended to capture butane rather than automatically releasing it to the atmosphere. Capturing and exhausting butane when it is released by a leak, spill, error, or operation is the purpose of the ventilation system.

The goal of the ventilation system is to keep the concentration of butane in the operating area low enough to be well below the concentration at which it can ignite or explode. The Lower Explosive Limit (LEL) is the minimum amount of butane in air that can ignite or explode. For butane, the LEL is approximately 1.6 percent in air.

The Canadian Centre for Occupational Health and Safety has an excellent web page that discusses industrial ventilation at http://www.ccohs.ca/oshanswers/prevention/ventilation/. The ventilation example images used here and selected text are from the CCOHS website.

Local exhaust ventilation captures gases such as butane at their source by placing the working system inside a hood to capture gases as they are released (see fig. 1).

TWO TYPES OF MECHANICAL VENTILATION SYSTEMS USED IN INDUSTRIAL SETTINGS

Dilution (or general) ventilation reduces the concentration of the contaminant by mixing the contaminated air with clean, uncontaminated air.

Local exhaust ventilation captures contaminants at or very near the source and exhausts them to the outside.

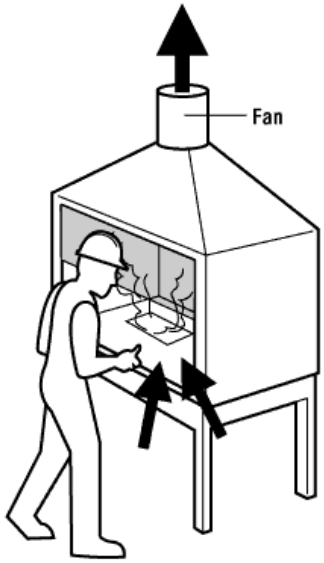


Figure 1. Local Exhaust Ventilation Hood

Local exhaust ventilation has advantages in that a relatively small amount of air is exhausted to capture the contaminant.

Dilution Ventilation uses general room supply and exhaust to dilute the contaminant even if it has left the vicinity of the extraction system. Dilution systems can take many configurations and some examples from the CCOHS are reproduced here (see fig. 2). Dilution requires large amounts of air supply to keep concentrations low.

Generally, dilution ventilation systems should be constructed to move air across the room rather than having both supply and exhaust near each other (see fig. 3). The exhaust should be near the work. Butane is heavier than air, so having both low and high supply and exhaust locations may be recommended.

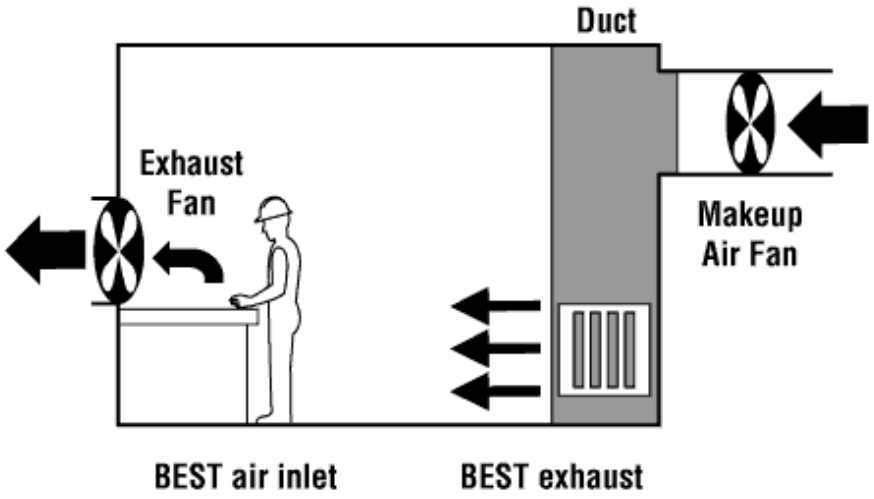


Figure 2. Dilution Ventilation Low Ducted Supply

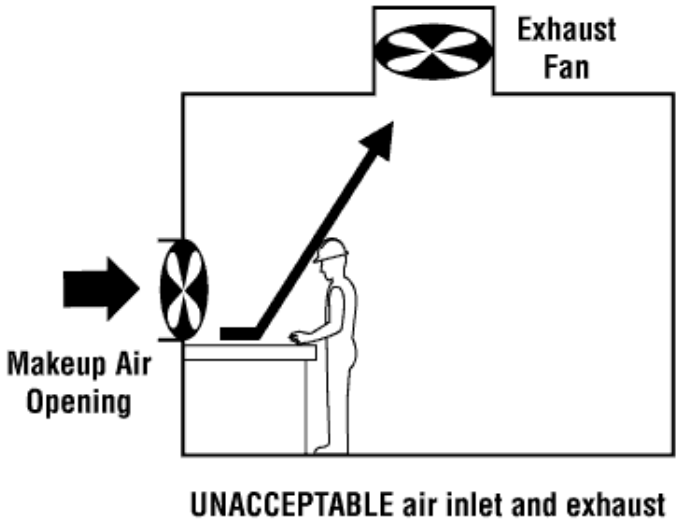


Figure 3. Unacceptable Dilution Ventilation Configuration

Ventilation systems are mandatory for CL Systems. Without ventilation, even a small leak or release of butane can quickly approach explosive levels.

Ventilation is very important during emptying of the extraction vessel of wet spent trim after leaching. Plant material wet with butane is extremely explosive.

Fans and motors used in ventilation systems should be explosion-proof. The use of a manufactured paint spray booth can meet many of the ventilation and explosion-proof system requirements when used for a butane extraction system (see fig. 4). Manufactured paint spray booths or paint mixing booths are supplied with explosion-proof ventilation and lighting. **A butane extraction system placed into a vented, manufactured paint booth may more easily meet fire department, industrial hygiene, or engineering requirements.** Fan speed and volume flow must be adjusted to the specific installation.

Figure 4. Spray Booth

CL System work areas should be kept free of clutter and unnecessary equipment or materials. Unneeded objects can easily disrupt air flow and create potential eddies where flammable gas could accumulate.

III IGNITION PREVENTION – REMOVE EXPLOSIVE TRIGGERS

Ventilation reduces the potential for gas to be present in concentrations above the Lower Explosive Limit. Systems and humans are not perfect. We need to reduce the potential for ignition of butane if the LEL is unexpectedly exceeded due to release, errors, or accidents.

Electrical equipment can often provide ignition sources. The number of electrical outlets, switches, light fixtures, and equipment in the area of the Closed-Loop Extraction System should be kept to a minimum. When possible, place electrical switches and equipment outside of the CL System area. Electrical equipment and light fixtures should be explosion proof (intrinsically safe) or placed out of the work room. Circuits should be ground-fault protected.

If a large (more than 30 gallons of butane present at any one time) CL System is in use, building and fire codes require additional precautions. **Explosion-proof electrical fixtures, rated fire walls and doors, sprinkler systems, and other special building components are required by building codes for high-hazard areas.** OSHA rules do not recognize the volume limits in the codes, so any use of even a few gallons of butane is considered very hazardous.

Hand tools such as corded or battery tools can be ignition sources. **Electric hand tools should be prohibited** from use during operation of a CL System.

Tools used directly on CL Systems such as wrenches or screwdrivers should be made of non-sparking materials. The opening of extraction vessels can produce micro-environments where the LEL is exceeded. **Non-sparking tools** can help to reduce risks of ignition around leaking fittings and equipment.

Pilot lights on water heaters, area heaters, stoves, furnaces, or other gas-fueled appliances can be a source of ignition for butane. Because butane is heavier than air, and cools as it evaporates, it can easily form a layer of flammable gas over a floor. When that flammable gas layer reaches a pilot light, explosions will occur. Do not place CL Systems in rooms or areas near any equipment with pilot lights.

Static can be a hazard around CL Systems. The use of anti-static mats at CL Systems may reduce risks from static-created sparks. Keeping light switches out of work areas and grounding of equipment may reduce risks.

The flow of liquid butane through non-conductive tubing or vessels can create a buildup of static electricity charge, providing an ignition source. Avoid the use of non-conductive materials on a CL System.

Figure 5. No Smoking

Smoking of any substance is prohibited around CL Systems. This includes the product that is created in your CL System. Post flammable gas and no-smoking signs in and around work areas (se fig. 5).

IV GAS DETECTION AND MONITORING

Butane is a colorless and nearly odorless gas, particularly at the low concentrations needed to form explosive mixtures in air. Unlike natural gas, no odorant is added to give the gas a warning smell. When butane concentrations rise to the levels where you can first detect an odor, the concentration is already near the Lower Explosive Limit. If you can smell butane in your work area you must immediately stop work, shut down your equipment, maintain active ventilation, and figure out where a leak or release is occurring.

Because you cannot smell butane until it is at dangerous concentrations, **gas detection and monitoring devices are needed for your protection**. Two types of detection equipment are used. They are fixed instruments to continuously monitor an area and portable instruments to spot check. Instruments may provide a readout that shows a percentage of the Lower Explosive Limit ("LEL") or may simply provide warning clicks or tones to indicate increasing concentrations of gas.

Fixed area gas monitoring systems typically report readings in percentages of the LEL. They are often set to alarm at different levels and may be arranged to close valves or shut down equipment at a particular percentage of the LEL. Area systems may have more than one gas detector around the work area. Often, one detector is located at the CL System to give immediate warning of a leak. A second detector can be located in the general work area around the CL System to indicate overall room concentration. Sometimes

detectors can also be placed at the exhaust ventilation port of the work area. Monitoring systems should be set to alarm at ten percent of the LEL. A well-designed system would shut down the butane supply and turn off heat sources at ten percent of the LEL.

Some butane closed-loop systems are built with area gas detection systems as an integral part of the equipment. If a CL System is installed that does not have an integrated gas detection system, a separate continuous area monitoring system must be installed. **Without a continuous area monitoring system, a leak or release may go undetected, risking serious injury or death**.

A hand-held flammable gas detector (see fig. 6) is used to check local levels of flammable gas and is very useful for detecting small leaks from a CL System**. Every operator of a CL System should own and use a hand-held flammable gas detector to check for leaks on a daily basis**.

CALIBRATION IS IMPORTANT

Many gas detection systems are calibrated to gases other than butane. The detectors respond differently to different gases. Lots of systems are calibrated to liquefied petroleum gas or methane (natural gas). If your detector was calibrated to methane and you are using butane, the LEL reading you see will be significantly low. If your methane-calibrated meter reads 10% LEL around your butane, you are really at 20% of the LEL of butane. Thus, when your meter reads 50% LEL, you already have an explosive atmosphere. Know and understand your instrument calibrations and get them recalibrated on a regular basis. Set the zero reading for your meter in a clean area well away from your CL System.

Figure 6. Flammable Gas Detector

V BUTANE STORAGE AND MANAGEMENT

Purchasing, storing, and moving butane is more complicated that it may seem. First, operators of a butane closed-loop system need to understand what butane is, what varieties of butane exist, how butane is graded, and what the properties of butane are.

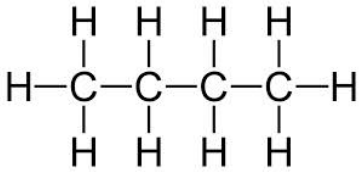


Figure 7. n-Butane

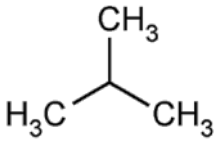


Figure 8. iso-Butane

BUTANE CHEMISTRY

n-Butane has four carbon atoms connected in single file and ten hydrogen atoms (C_4H_{10}) (see fig. 7). n-Butane is the solvent used by most CL Systems. Iso-Butane is also C_4H_{10}, but the carbon atoms are connected in a triangle (see fig. 8). This changes the properties significantly.

At room temperature n-Butane has a pressure of about 20-25 psi. At 30°F, the pressure is zero psi. Iso-Butane has higher pressures at room temperature and at 30°F.

Many CL System operators prefer to use n-butane due to its lower operating pressure and its very low vapor pressure at the freezing point of water. Some CL Systems use the differences between room temperature and freezing to recover the n-butane.

n-Butane is also known as "normal" butane which is usually 99% pure. Instrument grade or pharmaceutical grade gas may be 99.5% pure. In order to receive iso-butane (which you probably do not want anyway), you must specify that to the supplier. Iso-butane is also more expensive than n-butane.

NEVER FILL A BUTANE BOTTLE MORE THAN 2/3 FULL WITH LIQUID
Expansion space is needed because butane liquid expands as temperature increases.

Whenever possible, store your extra stock of butane outside your building in a secure, locked cage (see fig. 9). Limit the quantity of butane in the building to 30 gallons or less, unless you have specially-designed buildings and settings for your system. Place bollards (posts) in front of cages if vehicles could possibly strike the cage.

Figure 9. Flammable Gas Cage

KEEP VENTILATION SYSTEMS ON WHENEVER BUTANE IS STORED INDOORS – 24/7/365

VI TRAINING IS ESSENTIAL

If you have read this far, you are aware that the use of butane in industrial settings has many dangers. Allowing an untrained person to operate a butane closed-loop extraction system will greatly increase risks to everyone involved.

Training programs must be provided by a live in-person instructor. Computer-based training programs or e-seminars are not sufficient, according to State of Colorado regulations.

Training programs must be thoroughly documented including:

- *Training Outline/Agenda*
- *Date(s) of Training*
- *Trainer Name*
- *Record attendees and their MED identification numbers*
- *Signed statement attesting that each trainee knows and understands the material and can operate a butane extraction system in a safe manner*
- *All CL System operators AND the Owner/Key Operator must complete the training.*

VII PERSONAL PROTECTIVE EQUIPMENT

One of the first principles of safety and industrial hygiene is to first set up systems that keep hazards away from workers. Most of this document focuses on establishing such systems that keep workers safe without active attention.

Unfortunately, butane is an extremely flammable gas and fire and explosions will sometimes occur in butane closed-loop extraction systems facilities. Even in the best-run operations, an oversight, a moment of inattentiveness, or failure of a seal or fitting can result in incidents. Personal protective equipment is necessary to help protect workers and visitors for those occasions when problems occur.

Figure 10. Safety Glasses

SAFETY GLASSES ARE MANDATORY

Operating or visiting a butane extraction system can place a person in harm's way. The use of safety glasses is a standard throughout industrial production systems and hash oil workers should not be exempt.

The owner should pay for safety glasses, install signs requiring their use, and keep a bin of safety glasses next to the entrance to the CL System area (see fig. 10).

Prescription glasses are usually NOT safety glasses. Safety glasses can be purchased that fit over prescription glasses.

Flame-resistant coveralls or lab coats should be required for operators. Full-length pants, closed-top shoes and long sleeves should be worn at all times in the CL System area. Clothing should be made of fabric with a tight weave that can help resist ignition. Long hair should be worn up and under a hat of tight weave fabric.

Eyewash stations must be installed *in the work area of the butane closed loop extraction system, according to Colorado Law (see fig. 11). Plumbed systems with automatic temperature control systems built in are best. Place the eyewash station in the room where a temporarily blinded worker can still find it.*

Figure 11. Eyewash Station

VIII SANITATION

The manufacture of butane hash oil requires that food-grade sani
regular disinfection of surfaces, periodic deep cleaning, and persc

Figure 12. Hand-washing Sign

Make sure that signs requiring employees to wash hands are posted in each restroom and each area sink (see fig. 12).

Employers have an obligation to enforce the hand-washing rules.

Wiping down of all working surfaces with commercially-available disinfectant is required at least once daily. Floors must be mopped with cleaning solution every day.

Deep cleaning of all equipment and surfaces is required at least weekly.

Extraction equipment, Pyrex dishes, (see fig. 13) and utensils used for drying or whipping of wax must be thoroughly washed between each use.

Floors, walls, and ceilings must have cleanable surfaces. Use of plastic milk-board on walls and ceilings is recommended. Tile flooring is recommended. Carpeting is unsuitable for operation of a CF System.

Figure 13. Pyrex Dish

IX FIRE AND EMERGENCY RESPONSE

Part of an effective safety program is to have systems and procedures in place to use when bad things happen. Several items can help businesses and workers deal with emergencies.

SPRINKLER SYSTEMS

Everyone involved with safety appreciates building sprinkler systems. They save lives and dramatically reduce property damage. While sprinkler systems are expensive up front, they are cost-effective over the life cycle of a building.

Even a small sprinkler system limited to the area of the closed-loop butane extraction system is preferable to none at all.

Every facility with a closed-loop butane extraction system should have a written emergency response plan. Even a brief plan will help an organization prepare for and deal with emergencies.

The route to the nearest emergency room should be mapped out and posted near the CL System room. A copy of the map should be kept with the emergency response plan.

The plan should include a portion on building evacuation. How will you notify people to evacuate? Where will they gather? Who notifies the Fire Department? How do you make sure everyone is out of the building? Answering these questions and writing down the answers will save lives.

LEAK AND SPILL RESPONSE

If a monitoring device detects a leak:

- *Close valves to all tanks*
- *Vent vessels to outside and depressurize systems*
- *Shut down vacuum/recovery pump*
- *Turn off heat to solvent evaporation vessels*
- *Remove buckets from hot water*

EMERGENCY PROCEDURES - FIRE

- *Sound Alarm – Notify Others*
- *Call 911*
- *Evacuate area*
- *Use ABC rated fire extinguishers*
- *Use fire extinguishers (see fig. 14) only for small fires and to assist escape and to assist people*
- *Aim at base of fire*
- *If you need a second extinguisher – evacuate instead*

Figure 14. Fire Extinguisher

X MATERIAL SAFETY DATA SHEETS & HAZARD COMMUNICATION

Butane is a hazardous chemical. Businesses with butane closed-loop extraction system must have a Material Safety Data Sheet for all chemical products on site at all times. However, an MSDS is only part of a Hazard Communication Program. Failure to have and follow a written Hazard Communication Program is the number one general industry compliance problem cited by the Occupational Safety and Health Administration (OSHA).

Link to AIRGAS n-Butane MSDS

http://www.airgas.com/documents/pdf/001007.pdf

STEPS TO AN EFFECTIVE HAZARD COMMUNICATION PROGRAM*

1. *Learn the Standard/Identify Responsible Staff*
2. *Prepare and Implement a Written Hazard Communication Program*
3. *Ensure Containers are Labeled*
4. *Maintain Safety Data Sheets*
5. *Inform and Train Employees*
6. *Evaluate and Reassess Your Program*

**From: https://www.osha.gov/Publications/OSHA3695.pdf*

XI EQUIPMENT AND INSTALLATION REVIEW AND CERTIFICATION

The Colorado Marijuana Enforcement Division requires that all butane closed-loop extraction systems and installations be professionally reviewed. Section D of R605 – Retail Marijuana Products Manufacturing Facility: Retail Marijuana Concentrate Production and Section D of M605 – Medical Marijuana-Infused Products Manufacturer: Medical Marijuana Concentrate Production list these requirements in detail.

CLOSED-LOOP EXTRACTION SYSTEM LISTING OR REVIEW

Every professional grade, closed-loop extraction system capable of recovering the solvent used to produce Solvent-Based Medical Marijuana Concentrate must obtain:

a. *UL or ETL Listing*
b. *Use of solvents that are not listed for an extraction device requires approval by the manufacturer or a Professional Engineer*
c. *If not UL or ETL Listed, there must be a designer of record and the extraction device must be peer reviewed by a Professional Engineer.*

Colorado MED Laws and Regulations

http://www.colorado.gov/cs/Satellite/Rev-MMJ/CBON/1251592984795

A Colorado Marijuana-Infused Products Manufacturer that engages in the production of Solvent-Based Marijuana Concentrate must **obtain a report from an Industrial Hygienist or a Professional Engineer** that certifies that the equipment, Licensed Premises, and standard operating procedures comply with these rules and all applicable local and state building codes, fire codes, electrical codes, and other laws.

LOCAL FIRE DEPARTMENT

DO NOT START YOUR EXTRACTOR UNTIL YOU HAVE CONTACTED YOUR LOCAL FIRE MARSHALL

Your Fire Department has the authority to inspect buildings, fire hazards, equipment installations, and prevention measures. Your Fire Department may require a permit for the use of flammable gases inside of buildings.

*Keep your life simpler and **work with your Fire Marshall** from the start.*

XII OPEN BLASTING IS ILLEGAL, DANGEROUS, AND STUPID!

The use of Butane Hash Oil (BHO) extraction systems has been increasing rapidly in Colorado and other states. In underground markets, the use of open blasting through a tube (see fig.15) is a popular method.

Figure 15. open blasting set-up

Open blasting is when a canister of butane is drained through a tube filled with marijuana. The liquid mixture of butane and hash oil is then collected in a dish. **Open blasting is inherently dangerous**.

- In Colorado alone, during the first four months of 2014, firefighters in the state raced to at least 31 butane hash oil explosions. The use of open blasting causes a large number of injuries and significant property damage.
- The use of solvent-based extraction systems to recover hash oil by anyone other than a licensed facility is a felony in Colorado.
- Users have faced arson and numerous other charges from using these systems.
- Owners and managers at a marijuana grow operation (even legal ones) who instruct employees to use open blasting techniques may face criminal charges.

If your business is relying on the use of open blasting for production of hash oil you need to STOP BLASTING IMMEDIATELY! One incident, fire, explosion, inspection, or burn,and your entire entrepreneurial accomplishments will be gone. **Do not open blast. Do not even thinkabout doing it**.

*It is in the interest of the newly legal, legitimate industry that uses properly installed closed loop to **stop everyone from open blasting.** If you own or run a retail operation, stop selling blasting tubes and cans of butane. They may come back to burn you.*

XIII SELECTING AN EXTRACTION SYSTEM

Business owners face difficult decisions when selecting extraction systems. In 2014, butane had most of the extraction market, with carbon dioxide in second place. In 2016, the market is wider.

CO_2 systems are expensive per unit of oil produced, but they provide extraction selectivity and do not necessarily use explosive gases. Therefore, facility costs are lower for CO_2 than for butane.

Propane and butane can be used together in some systems, but operating pressures are higher with propane. Facility costs continue to escalate for butane and propane systems while the system costs are moderate.

In 2016, ethanol and isopropyl alcohol systems are becoming widely used and are often less expensive than pressurized butane systems. Alcohol system operators claim that they can produce the same products at the same quality as butane or CO_2 systems. Alcohol is somewhat less hazardous to work with than butane, so facility costs can be significantly lower.

Whatever type of system you purchase, the operation of these devices can and will present hazards to you, your employees, and your facility business. Careful system selection, planning, training, documentation, and facility preparation will pay for itself many times over.

XIV CHECKLIST – ITEMS FOR CONSIDERATION

Ventilation System Design ☐ Ventilation Air Flow Pattern ☐ Sufficient Supply/Makeup Air ☐ Fan Type and Construction ☐ Ventilation Volumetric Flow ☐ Air Flow Speed at Extractor ☐ Ventilation Always On ☐ Clutter Does Not Impact Air Flow	**Butane Storage** ☐ Butane Bottle Fill Limits at 2/3 of Capacity ☐ Storage Outside in Locked Cage ☐ Interior Total Volume (Including in Process) Limits Set and Observed ☐ Bottle Restraints in Place ☐ Butane/Air Mixture Separation Procedures ☐ 99+% n-Butane in Use
Limit Volume of Butane ☐ High-Hazard Occupancy Limits Evaluated ☐ Explosion-proof Equipment ☐ If H-Occupancy: Is Architectural/Engineering Designer Involved ☐ Outdoor Butane Storage	**Personal Protective Equipment** ☐ Safety Glasses Free & Available ☐ Safety Glasses Worn in Work Area ☐ Flame-resistant coveralls or lab coats ☐ Safe Work Clothing ☐ Closed-Top Shoes
Ignition Sources ☐ Placement and Type of Electrical Equipment (Switches, Outlets, Lighting) ☐ No Pilot Light Appliances Near Work Area ☐ Static Control ☐ Non-Sparking Tools ☐ No-Smoking Area ☐ No Portable Electric Tools During Operation	**Training Program Documents** ☐ Training Outline/Agenda ☐ Presentation Materials ☐ Taught In Person ☐ Standard Operating Procedures Covered ☐ Safety Procedures Covered ☐ Key Employee and Operators Trained ☐ Training Records: Signed & Maintained
Flammable Gas Monitoring ☐ Hand-Held Combustible Gas Meter/Leak Detector In In Place and Operational ☐ Area Combustible Gas Meter/Leak Detector In Place and Operational ☐ Solenoid Valves Connected to Detection System ☐ %LEL Alarm and Shutdown Levels Set ☐ Calibration of Detectors ☐ Daily Leak Check	**Sanitation** ☐ Written Cleaning Procedures ☐ Daily & Weekly Cleaning ☐ Hand Washing Required ☐ No Sick Operators Allowed ☐ Dishwashing ☐ Cleanable Walls, Floors, Ceilings
Signage & Posting ☐ No Smoking Area ☐ Flammable Materials ☐ Hand Washing Mandatory ☐ Area Butane Volume Limits ☐ Extraction Room Identification ☐ Route to Nearest Emergency Room	**Emergency Response** ☐ Written Emergency Response Plan ☐ Fire Extinguishers in Place ☐ Fire Extinguishers Maintained ☐ Work Area Fire Sprinkler System Considered ☐ Leak and Spill Response Procedures
☐ **Hazard Communication Program** ☐ Material Safety Data Sheets Kept for All Chemical Products ☐ Written Hazard Communication Program ☐ Manufacturers' Labels Maintained ☐ Employee Training	**Extractor System Engineer Peer-Reviewed** ☐ Extractor System Venting System in Place ☐ Fire Department Flammable Compressed Gas Permit ☐ Fire Marshall Contacted ☐ Certified Industrial Hygienist or Professional Engineer Review Documented