EXTRACTOR SYSTEM OVERVIEW

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CERTIFIED SYSTEMS

Our botanical herbal oil extractor system is designed to effectively extract essential oils and extracts from herbal materials using pressurized light-hydrocarbon solvents. This system is a closed-loop type specifically designed for the use of LPG (butane) as the extraction solvent. LPG solvent avoids the need to use extreme temperatures or pressures in the extraction process and can be completely removed from the extracted solutes with basic evaporation techniques.

Design

Certified: The system pressure vessels are manufactured and marked ASME certified for MAWP of 250psi @ 100°F, designed for LPG use. The accessories and hoses are rated LPG-350-PSI to meet NFPA-58 regulations for LPG installations. ASME: American Society of Mechanical Engineers; ref. BPVC Section VIII - Rules for Construction of Pressure Vessels Division 1 (BPVC-VIII-1 - 2013). NFPA: National Fire Protection Association; ref. Liquefied Petroleum Gas Code (NFPA-58 - 2017).

Cleanable: The system vessels and accessories are manufactured of food-grade 304/316 stainless steel and are electro-polished for producing pure extracts and ease of cleaning after extraction. Rounded edges, seamless tubing and polished welds help ensure sanitation standards can be met. Many tank models have bottom drains for easier solvent wash-down and sterilization.

Modular: The extractor design allows many variations on the basic extraction process. Available connections, valves and accessories permit a variety of process steps to be used or modified. A wide range of temperatures, pressures and dwell times are possible for different process steps. An enthusiast can certainly develop one's very own special process.

Safety

Flammable: LPG (liquefied petroleum gas: butane is extremely flammable and can create an explosive atmosphere when mixed with air. LPG becomes explosive at as little as 2% content in air. Keep away from open flames, heat, sparks, and hot surfaces - no smoking.

Leaks: Although this extractor system has closed-loop type design intended to operate without leakage of the LPG, and to recover the solvent after extraction for reuse, some release of LPG must be expected and planned for. The herbal materials may retain some LPG depending on how thoroughly vaporized after extraction, which may be released upon removal from the unit. Some process steps may release a small amount of LPG, as when purging air from a hose. One must plan for the possibility of an operating error or improper seal allowing an outright LPG leak. Equipment must be configured with shutoff valves on every nozzle of every pressure vessel to permit quick isolation of any component.

Heavier-than-air: LPG is heavier-than-air and will sink down to the floor or ground and collect in low areas, corners, basements and crawl-spaces. The basic rule is to never allow an accumulation of LPG at even one-fourth the explosive mix, or less than ½% - that is very little. You cannot smell LPG if not odorized.

Ventilation: The key to safety when extracting using LPG is proper ventilation. Where permitted, operate the extractor system in an open area away from walls or low spots and away from any sources of ignition. Where necessary to operate indoors, a properly designed hazardous environment facility must be used, with suitable exhaust ventilation for LPG, explosive atmosphere electrical and fire safety equipment, and proper storage of the LPG supply.

PPE (Personal Protective Equipment) is vital for operator safety. Proper gloves and eye or face protection are always necessary. Clothing should cover all flesh and be rated FR for Flame-Resistant (ref NFPA-2113). Besides a flash fire hazard, compressed LPG upon release is very cold and can cause immediate frostbite of any exposed flesh. In addition to an explosion hazard, concentrated LPG can displace air in a confined space and cause asphyxiation without warning. Indoor facilities should and may be required to have LPG gas detector devices to warn of a leak or developing hazard.

Equipment: Electrical equipment within the hazardous area should be rated explosion-proof or intrinsically-safe and be grounded to earth. Exhaust ducting should be rated conductive and be grounded. Exhaust fans should be rated for LPG and be grounded. The recovery pump should be rated suitable for LPG and set-up not to exceed the pressure rating of the recovery tank. The vacuum pump needs to be suitable for LPG and vented outdoors unless only venting air or proceeded by a separator or trap device to remove the LPG before the pump. Firefighting equipment should be ready; at least a portable extinguisher and perhaps a sprinkler or extinguishing system (consult the local fire department).

Safety **V**alves: Pressure vessels come with pressure relief safety valves, to prevent an excessive gas pressure build-up. They are set to the vessel pressure rating and must not be removed. Accessories, pipes and hoses exposed to liquid LPG must be equipped with a hydrostatic relief valve between any two shutoff valves, to release pressure from liquid expansion due to warming. They are set to 450 psi and must not be removed. A separate new hose or pipe run needs to include a hydrostatic relief valve.

Regulations: The facility must comply with all state and local regulations and codes, which often refer to national standards like NFPA and federal regulations like OSHA (consult the local building and fire departments). For reference, an LPG solvent extraction area within a facility is classified a Class 1, Division 1, Group D explosive atmosphere hazardous area (which may also apply to other areas).

Standards: The design standards for equipment and facilities, and the standard procedures for LPG storage and operating equipment, have been developed to minimize dangers and improve safety. It is critical that these standards and procedures are stringently followed to minimize risks and accidents.

Please give safety it's proper due, so you can enjoy the fruits of your labors. Always, **SAFETY FIRST**.

From MSDS – Material Safety Data Sheet – for LPG

First-aid measures:

After inhalation	Remove victim to uncontaminated area wearing self-contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
After skin contact	For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensations have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.
After eye contact	Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Get immediate medical attention.

Firefighting measures:

Suitable extinguishing media: Carbon dioxide, dry chemical, water spray or fog.

EXTREMELY FLAMMABLE GAS: Forms explosive mixtures with air and oxidizing agents.

EXTREMELY FLAMMABLE GAS: If venting or leaking gas catches fire, do not extinguish flames as flammable vapors may spread from leak, creating an explosive re-ignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering a confined area, check the atmosphere.

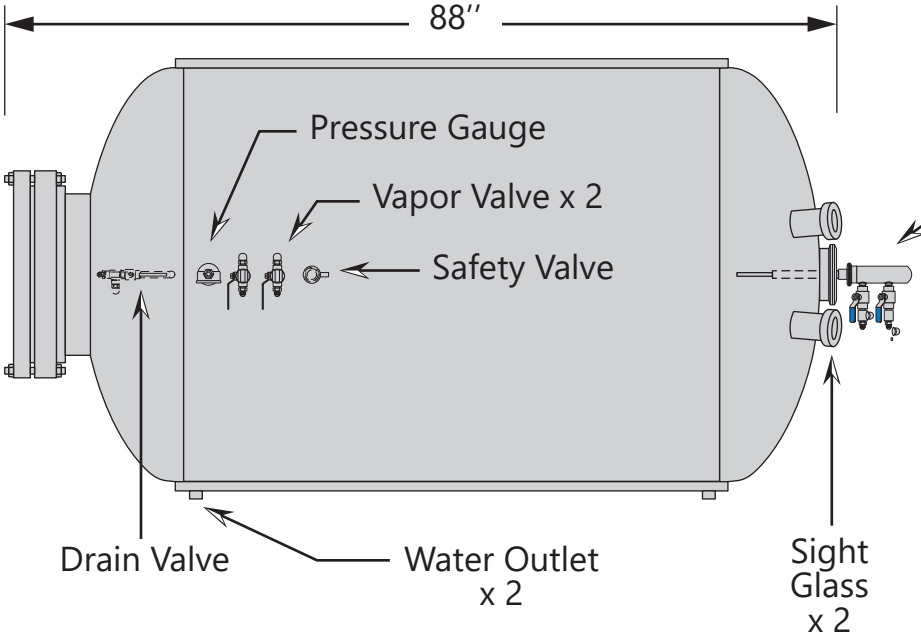
Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so.

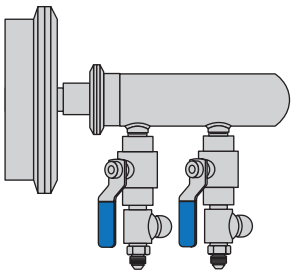
ASME CERTIFIED CHAMBER TANK
DWG 248-1137, HORIZONTAL, W/ MANHOLE

OTHER SIZES:

EQUIPPED FOR A CERTIFIED SYSTEM
ASME "U" MARKED, MAWP 250 PSI @ 100°F
WATER JACKET MAWP ,15 PSI
CES MODEL CH480 - 80% FILL ~420 GAL

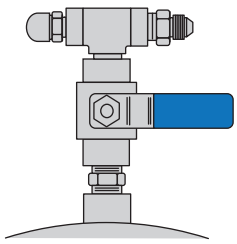
TOP VIEW

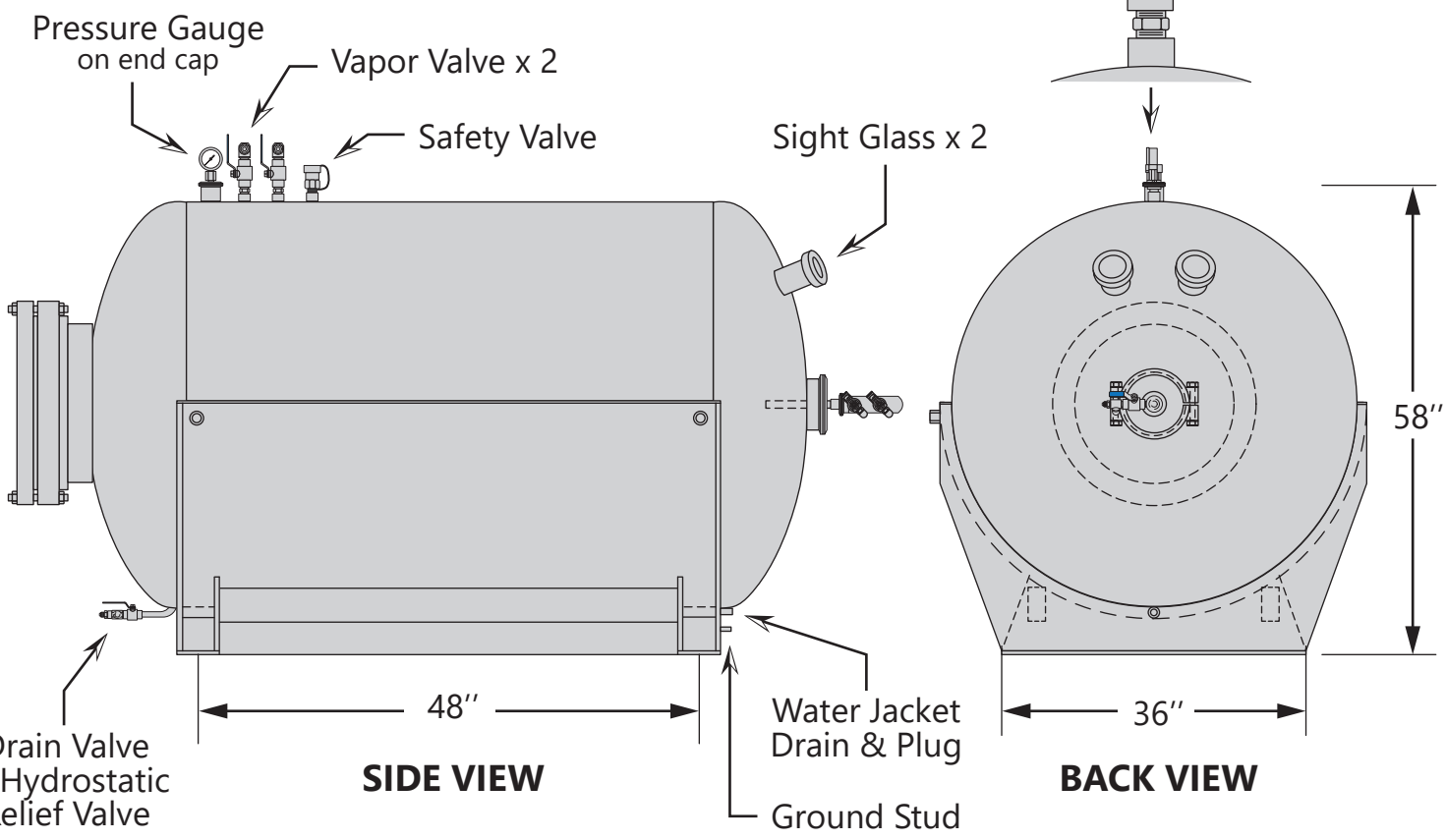




DUAL INLET ASSEMBLY
6" TC Port w/ 1/2" Pipe Nipple
& Internal Tube

VAPOR VALVE ASSEMBLY
1/2" Ball Valve w/ Nipple, Tee, JIC,
& Hydrostatic Relief Valve





SIDE VIEW

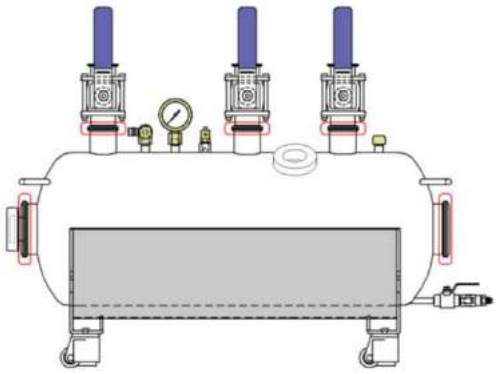
BACK VIEW

Our current iteration of the butane extraction system comprises of a three ASME certified horizontal 420 gal chamber tanks with a manhole. It operates via a relative pressure differential caused by a jacket of heated or cooled ethylene glycol to move the butane from the solvent tank to the product tank, where it covers 400 lbs of hemp biomass with 300 gallons of butane. These tanks have the capacity to hold well over 1000 lbs of hemp biomass a run, which lasts between 6 and 8 hours.

After a brief soak, the pregnant butane moves via relative pressure through a mesh filter, followed by a mult-cake molecular sieve. After running through the sieve, it is deposited into the sauce/crude tank where the mixture is heated. The vapor caused by the heat then passes through a chilled condensing tube where the vaporous butane reverts to its liquid state. With a combination of relative pressure differential and gravity, the butane returns back into the solvent tank, leaving the cbd sauce or cannabis crude in the sauce tank.
The 10 ton process chiller chills the ethylene glycol and pumps it to the tanks as needed at a set point temperature value. The process heater is an Ethylene Glycol heater supplying heated ethylene glycol to the tanks as needed at a set point temperature value. The vacuum pumps purges moisture and oxygen from the entire system.

Horizontal chambers offer much more liquid surface area than the same diameter vertical chambers for faster evaporation. They typically have one or more 2" TC ferrule drop ports, and a 2" TC ferrule vapor port, all equipped with 2" TC ball valves, with a bottom-drain, separate access ports on the ends, and a water jacket.

If equipped with other sized drop tubes, use concentric expanders or concentric reducers as necessary to fit the appropriate shutoff valves and material tubes.
Note: A separately-mounted manifold & filter-dryer assembly can be used with any evaporation chamber, via a hose connection to a ball valve at the vapor port.



current system with heater chiller &molecular filter added

