Pelletizer PE 80

USER MANUAL

CONTENT

INTRODUCTION

This manual should be kept with the owner and be readily accessible for safety, operation and maintenance.
The graphics used in this manual may show machine details that may be different than the actual machine. Components of the machine may have been removed for illustrative purposes or the continuing improvement of the machine's design cause changes that are not included in this publication.
The owner of this machine is responsible for verifying the operator of this machine is properly trained and understands the contents of this manual.

About the machine

This technology is the subject of several pending patent applications worldwide, including US patent application No. 10/363,762 and European patent application No. 01960192.1

To obtain long and trouble-free operation of the equipment we recommend reading this manual carefully. All new operators of the equipment should also familiarize themselves with the content of this document.

What is dry ice?

Carbon dioxide is a chemical compound formed by combining one atom of carbon with two atoms of oxygen and is expressed by the chemical symbol CO_2. It can exist in three states: a gas, a liquid or as a solid.
Dry ice is solid carbon dioxide (CO_2). The unique property of carbon dioxide is that at normal, atmospheric pressure and temperature, it changes state directly from solid to gas without going through a liquid phase. This process, called sublimation, makes the ice 'dry'.
Dry ice is stable at (minus) -79ºC(-110ºF), at atmospheric pressure. It expands up to 800 times by volume when it sublimes, and this property is exploited for instant cooling of food and pharmaceutical products during processing, transportation and storage. The properties of dry ice are also used for other industrial applications, such as dry ice blasting (cleaning of machinery through thermal shock).

The dry ice pelletizing process

The Pelletizer takes liquid carbon dioxide from the carbon dioxide storage vessel and feeds it into the main pelletization chamber. Within the main chamber three injection valves are located to allow the liquid into the three compressing chambers.
The volume of liquid CO_2 injected into the compressing chambers, and consequently the rate of dry ice production, is determined by varying the valve opening time.
A sudden pressure and temperature drop occurs when the liquid enters the compression chambers, by which approximately 50% transforms into 'carbonic snow' and about 50% transforms into gas (known as ´revert´ gas).
The revert gas is vented to the atmosphere. Recovery systems can be added to liquify the revert gas, as increase the utilization rate of the liquid CO_2.
An electrical motor with a gearbox drives a crank shaft and 3 mechanical pistons to compress the carbonic snow that has been retained in the compression chambers. The snow becomes a block of dry ice which is subsequently pressed through extrusion plates to form 'spaghetti' strings. The strings will tend to break at the break line formed by each compression stroke to make the characteristic "pellets".

Pellet sizes, denominations and applications

Pellets can be made in a variety of sizes (diameters) for different applications. The size (diameter) of pellets depends on the size of the holes in the extrusion plate. A set of 3 extrusion plates for manufacturing pellets of Ø3 mm (1/8") is provided with the Pelletizer PE 80 as standard. The nominal production capacity of the equipment has been rated with this format. Production capacity will be marginally different for pellet sizes other than 3 mm.

Size	Denomination	Applications
Ø 1,7 mm (1/16″) and Ø 2,2 mm (3/32″)	″Micro-pellets″	For dry ice blasting (cleaning) of objects and surfaces. They are used for cleaning of objects and surfaces with small cavities and fine patterns that need to be penetrated with smaller particles. Micropellets are for instant use shortly after their production.
Ø 3 mm (1/8″)	″Rice pellets″ /″traditional″ pellets /just ″pellets″	For dry ice blasting and for quick cooling of food and biopharmaceutical products. Especially used in wineries during the vintage season, to prevent premature fermentation of the grapes. Rice pellets (Ø 3mm) are used for the vast majority of dry ice blasting / cleaning applications and should be used no later than 3 days after production in order to preserve the needed quality and density.
Ø 8 mm (5/16″) and Ø 16 mm (5/8″)	″Nugget″	For cold chain applications (transportation and conservation of food and biopharmaceutical products).Nuggets are mainly used for cooling applications since the reduced ratio of surface area to mass, reduces the rate of sublimation. so that the last for a longer period of time, before they sublimate.

Storage tank for liquid CO_2

Dry ice manufacturing starts with liquid carbon dioxide flowing to the pelletizer from a storage tank where the liquid is held under pressures between 14-23 bar (200-330 psi).

The PE 80 Pelletizer's nominal production capacity is rated at a pressure of 15-18 bar (215-260 psi).

Supplier responsible for the equipment

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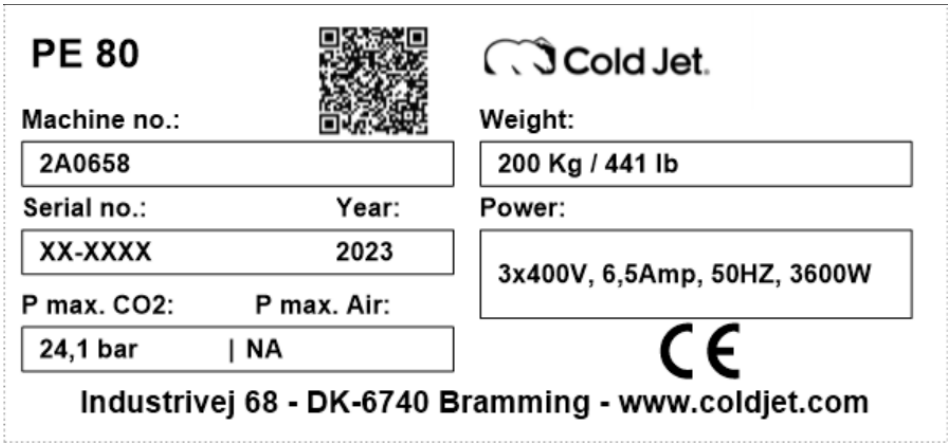
Technical data

Production capacity	20-80 kg/hour (80-176 lb/hour)
Conversion rate (Liquid CO_2 to dry ice) without recovery unit when producing standard 3mm pellets	2.5:1
Conversion rate (LCO_2 to dry ice) with recovery unit	1.2:1
Voltage Options	
400 V/50 Hz	3 KW (6.5 A)
480 V/60 Hz	3.6 KW (6.5 A)
3x220 V/50Hz	4 KW (15 A)
3x220 V/60Hz	4 KW (16 A)
Lubrication oil	Castrol Optileb® GT 460
Required start-up amp. Should be calculated as 5 to 6 times amp usage.	
Standard dimensions (width x depth x height)	600 x 1000 x 1400 mm
Standard dimensions (width x depth x height) – transport/storage frame	650 x 1200 x 1500 mm
Weight - Weight including transport/storage frame	200kg – 265 kg

System identification

The machine is marked with EU (CE) approval.

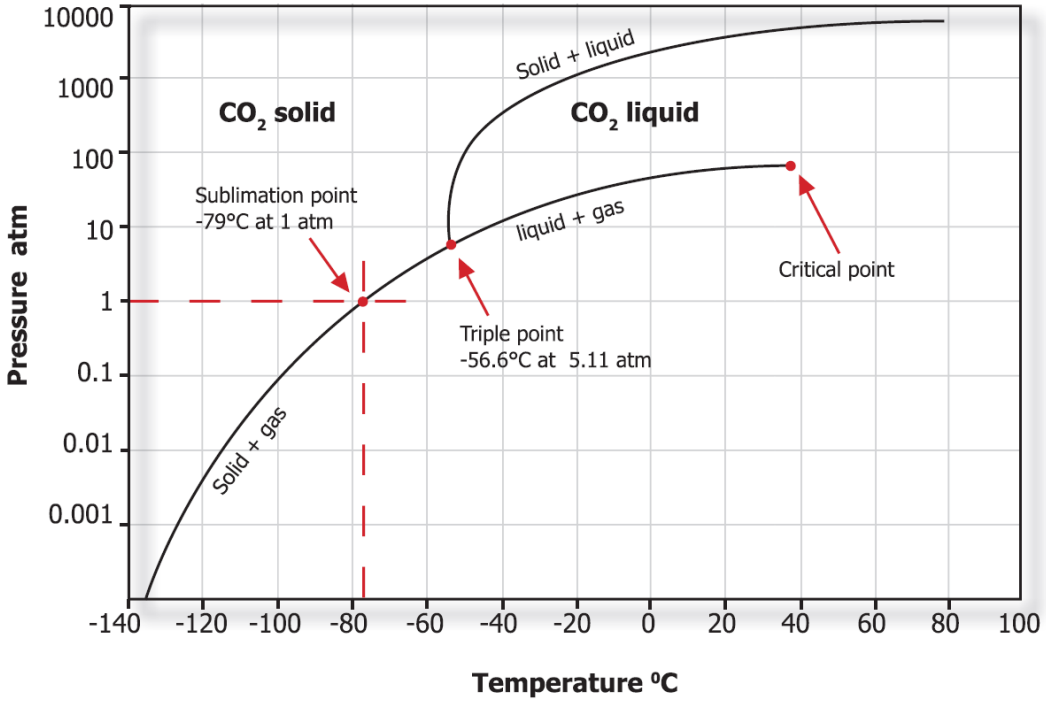


Example of a system identification, values and numbers may vary.

Dry ice is frozen carbon dioxide (CO_2). It is much denser and colder than traditional ice. Dry ice is -79°C (-110°F). Traditional ice is 0°C (32°F).

In addition, dry ice does not melt - it sublimates. Sublimation is the process of going directly from solid form into gas form. Dry ice by-passes the liquid form, hence the "dry" ice.

The first step in producing dry ice is to turn the carbon dioxide gas into a liquid. This is done by compressing the CO_2 and removing excess heat. Next, the pressure is reduced over the liquid carbon dioxide by sending it through a snow valve (expansion valve). As the liquid evaporates, it absorbs heat, causing some of the CO_2 to freeze into dry ice snowflakes. The dry ice snow is then exposed to compaction by a large press to form blocks. Dry ice is much heavier than traditional ice, weighing 1.7 times as much. CO_2 is a natural substance produced by the combustion of organic compounds and is exhaled by humans and other living beings.



Pressure- Temperature phase diagram for CO_2

CO_2 is:

:: Non-toxic
:: Transparent
:: Odourless gas under atmospheric pressure and temperature
:: 1½ times heavier than air
:: The atmosphere consists of 0.03% CO_2

CO_2 exists in three forms:

:: Gas, e.g. used in the food industry
:: Liquid, kept under pressure
:: Solid, dry ice

SAFETY REGULATIONS

General measures
The manual contains instructions for starting up, operating, and servicing the machine. The operator must follow all instructions in this manual. The owner must make sure that the operator understands the contents of this manual and follows its guidelines and safety regulations.

Personnel qualifications
Employees, who are in charge of installation, operation, service, and maintenance must be adequately trained to install and operate this machinery.

If the employees do not possess sufficient knowledge, they must be instructed and trained properly. If necessary, this can be arranged in cooperation with the manufacturer of the machine.

The owner of the machine shall make sure that the operator, who is to work with the machine, fully understands the importance of studying the contents of this manual and comply with the SAFETY REGULATIONS described on the following pages as well as those placed on the machine.

Security and risk
The machine is designed to comply with the EC Declaration of Conformity for Machinery. Therefore, using the machine does not pose a risk to the operator when the instructions in this manual are followed.
It is important that the operator follows the safety signs posted on the machine and the safety regulations described in this manual and that the operator reads and understands the contents of this manual before starting up the machine.

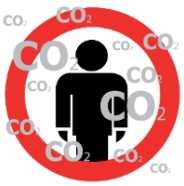
The machine may only be installed by authorized personnel with knowledge of the Council Directives BT 2014/35/EU and EMC 2014/30/EU (or similar directives in other parts of the world).

Danger of suffocation

Dry ice pellets are CO_2 in solid form. At ordinary atmospheric pressure, CO_2 can only exist in this solid form at temperatures of -79°C (-110°F) or lower. Therefore, during dry ice production, the CO_2 will immediately be heated and thus transform from solid form into gas form.

Please note:

Since the specific gravity of CO_2 is higher than that of ordinary atmospheric air, the air with its contents of oxygen will be replaced by CO_2 if the dry ice production is taking place in small or insufficiently ventilated rooms.



Therefore, please note the following:

1. Low CO_2 concentrations (3-5%) may cause headaches and rapid breathing.
2. CO_2 concentrations of (7-10%) may cause headaches and nausea and may result in unconsciousness.
3. Higher CO_2 concentrations will result in unconsciousness and suffocation.

High CO_2 concentrations may result in unconsciousness due to the displacement of oxygen. Therefore, always provide sufficient ventilation of the working area, and avoid producing dry ice in small rooms.

Static electricity

Dry ice can cause electrostatic discharges. However, the equipment is bonded to the ground to minimize electrostatic discharge, and the warning sign is meant to instruct the operator to avoid placing the equipment in rooms containing explosive gasses.

It is recommended to use a plastic shovel in the dry ice container.

Danger of congelation

CO_2 in solid form has a temperature of -79°C (-110°F)
/-110°F or lower at atmospheric pressure and can therefore cause serious congelation injuries.

IMPORTANT!

The dry ice is extremely cold, therefore, do not touch parts of the machine, which are in direct contact with the dry ice without wearing appropriate protective clothing and gloves.

MACHINE STRUCTURE

Power

Connect a power supply cable to the socket at the PE 80. Use a phase inverter at socket if needed. Only three poles and earth are used. Neutral is not needed.

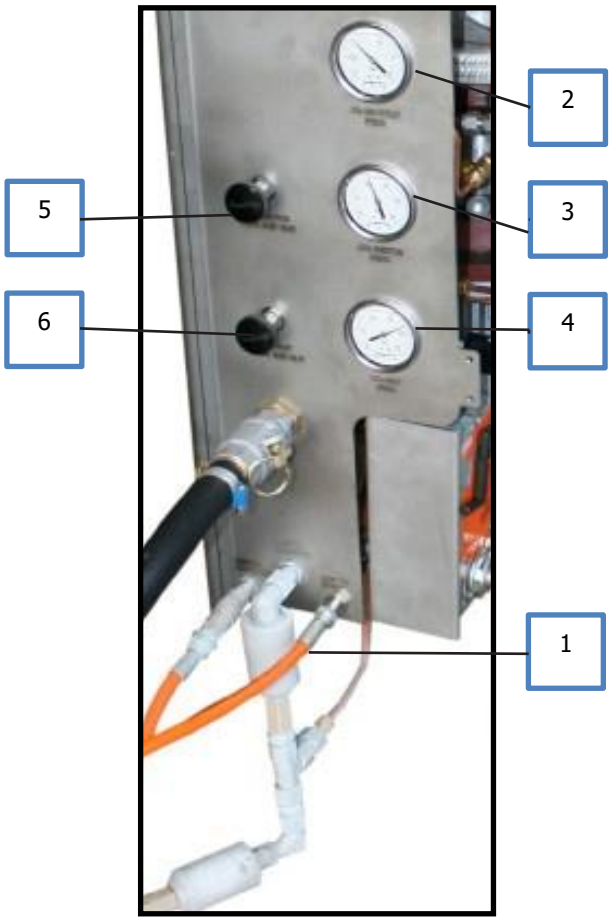
Hoses

The hose for the liquid CO_2 is connected to the pelletizer at the "LIQUID" inlet (see 1).
The noise damper is already connected on to the outlet for pressure compensation to a recovery unit.

To maintain a suitable pressure at the vessel during operation (14-23 bar, 188-362 psi), adjust the pressure at the regulator on the vessel.

Important notice before startup

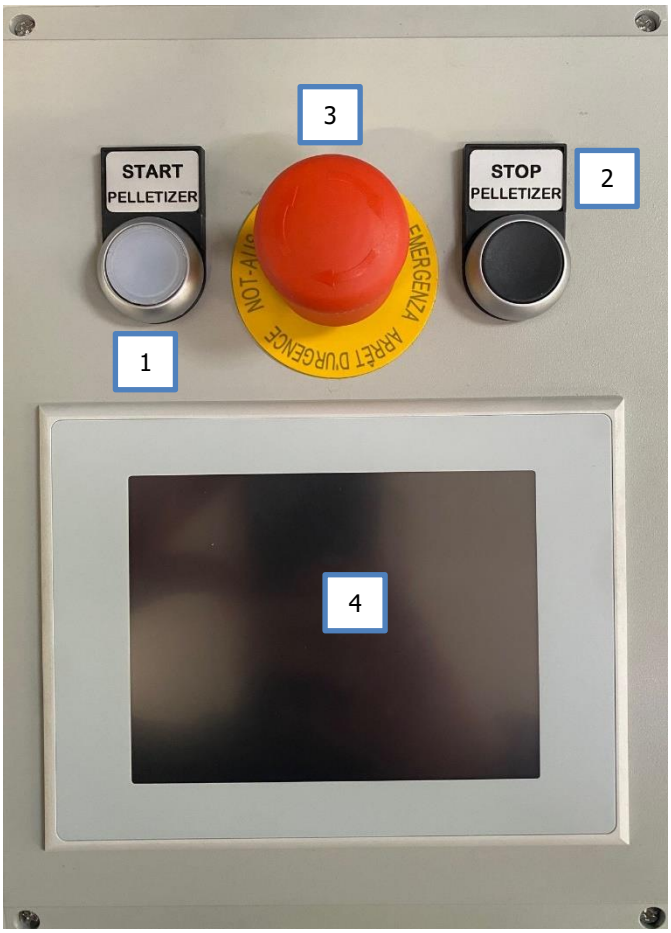
Make sure that all electrical and CO_2 connections are correct and that you have read the safety article 2 section 2 and this manual entirely.



1. Gas outlet
2. Injection pressure with damper
3. Tank pressure
4. Decompressing unit after electrical CO2 valve
5. Decompressing inlet filter and CO2 inlet hose (Remember to close tank valve)

MACHINE CONTROLS

Operation panel



1: Start button

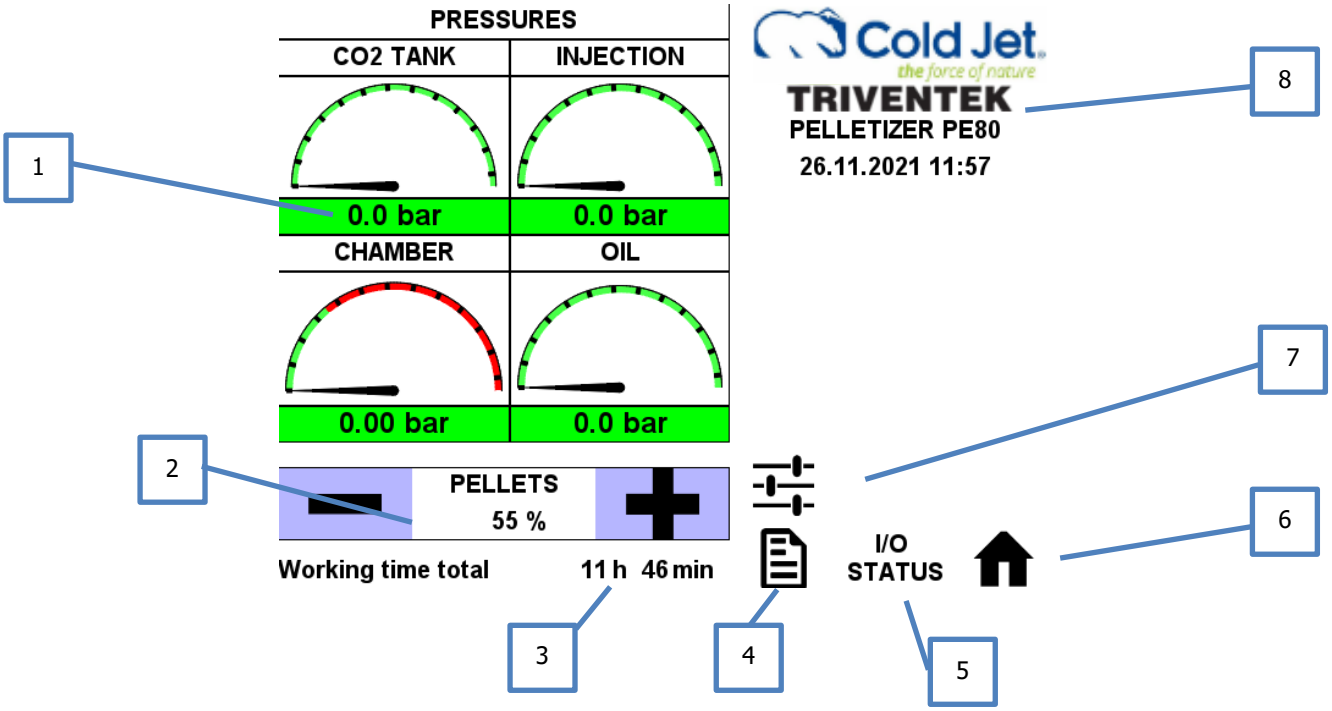
2: Stop button (For short periods 3-5 min)

3: Emergency button

4: Display

N.B.: NEVER use the emergency stop button as a means to make a process stop to the machine – ONLY use it in case of an emergency since the machine can be damaged.

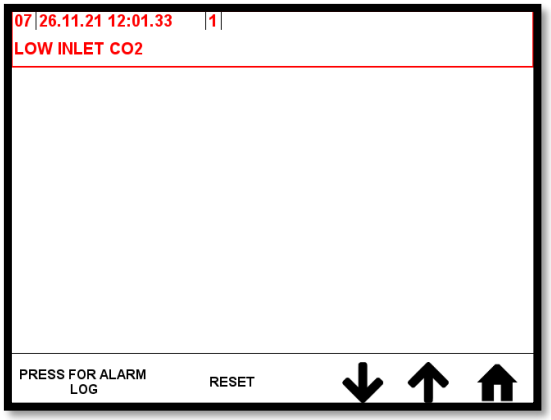
Main menu structure



1. Pressures in the pelletizer
2. Adjustment of capacity
3. Hour counter
4. Info
5. Input / output status on transmitters
6. Home screen button
7. Settings
8. Logo with time and date

Sub menus

When an alarm is present, this message will appear. Press the screen to enter the alarm menu.

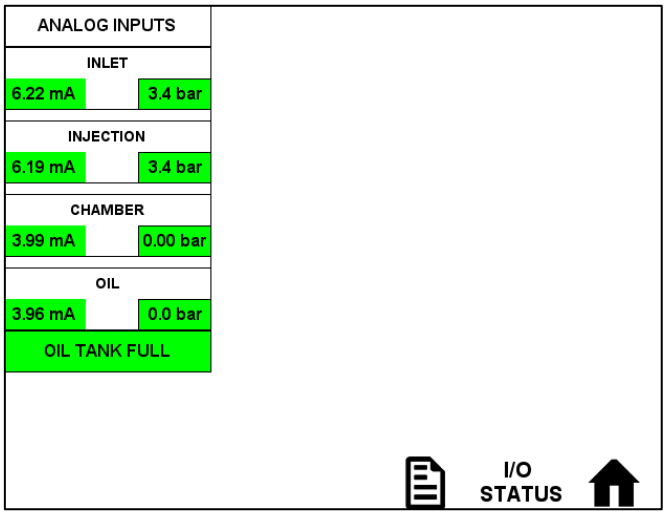


When the alarm has been corrected, press "reset" to clear the error. Then press the "Home" button to enter the main menu.

If the pelletizers have not been stopped for more than 5 min, it can be restarted.

If longer please see the restart description in this manual.

Input / output status:



This menu shows the mA signal on each of the four pressure transmitters.

This is a help to trouble shooting.

If the pelletizer is completely empty for CO_2 all transmitters will show approx. 4mA.

If the reading is above this, the pressure transmitters are faulty and should be changed.

START UP SEQUENCE

1. Power supply must be plugged in and turned on.
2. Open the liquid CO_2 supply – slowly - to avoid creating an ice block in the line.
3. Press the START button and the LCO_2 valve will open automatically.
4. Filling sequence will begin. Display shows " Pelletizer is starting, please wait".
5. When start-up sequence is finished the PE 80 will start production automatically.
6. Set the CO_2 injection level to 100% in "Pellets menu" (only necessary for first time use).
7. The Pelletizer will now begin to inject liquid CO_2 and produce dry ice pellets.
8. During the first period of the start-up, dry ice as snow will be blown out of the extrusion plate(s) at the front of the Pelletizer. After a few minutes a solid ice block will be formed inside the Pelletizer chamber (not necessarily simultaneously) and the production of pellets will begin.

   Some pellets will be 'shot' out at speed, in the beginning, until the ice production has stabilized.

EXTREMELY IMPORTANT INFORMATION

Re-start sequence

(for stops lasting longer than approx. 5 minutes, depending on local conditions):

1. Follow step 1-6 in the Start-up sequence – if the pelletizer does not start producing pellets on all 3 extruding plates after approx. 1 minute and only sprays ice-dust, shut down by pressing the STOP button immediately or you will damage the machine. (see item 5.4 "Shut down sequence".

   DO NOT STOP BY USING THE EMERGENCY STOP BUTTON

   There is most probably a water-ice blockage in the press head due to accumulated humidity.
2. Remove the covering.
3. Press head and gas separator house is heated gently with an electric heat gun. No other thawing equipment such as burners and similar may be used, otherwise there will be danger of damaging O-rings and silicone tubing in the machine.
4. When the press head and the gas separator house is completely dry and free of ice everywhere, you can safely restart the machine.
5. For large amounts of visible exterior ice at the press head and the gas separator house, do not attempt to remove the ice with hard blows at the ice - it must be thawed slowly (see item 3) in order to not damaging the machine.

   After thawing remember to re-mount the covering correctly before attempting to re-start once more.

Shut down sequence

1. Close CO_2 liquid valve from tank.
2. The Pelletizer will now automatically drain the supply line.
3. When liquid line is drained the unit will shut down after approx. 1 minute.
4. Display will show " Pelletizer LOW INLET CO_2 " and the red LED light will light up: This is a normal message when the Pelletizer has been properly shut down , please clear the message before leaving the pelletizer.
5. To stop for a limited period*, press the STOP button on the operations panel.

*NB. Please note that, depending on the level of ambient humidity, stopping for more than approx. 3-5 minutes, brings the risk that humidity will condense onto the dry ice behind the extrusion plate and cause damage, due to the blockage of the 3 pcs. dies' holes with water ice, on re-starting.

Many short start/stop sequences add a lot of wear and tear to the pelletizer therefore it is recommended to operate the pelletizer in long productive sequences.

ALARM MESSAGES

Message	Explanation	Notes
Low inlet CO_2 error	CO_2 supply is turned off (could be shut down mode) CO_2 tank is empty CO_2 inlet filter is blocked	
Motor protection error	Overload on the main motor Overload on the oil pump motor	• Check settings on the protection devices • Check status of motor protection device • Check load on the motors if they correspond to the data on the motor label • Check for loose connections at the wires and terminals When problem is corrected, press "reset" to clear the error
Power supply error	• Wrong phase direction • Missing phase	• Check phase direction at your installation • Check your installation plug
Emergency stop message	• Emergency stop button is pressed in • Deactivate the button When problem is corrected, press "reset" to clear the error	
Low oil pressure	• Check if oil pump is running • Check for leakage in the system • Broken oil pressure switch When problem is corrected, press "reset" to clear the error	
Low oil level	• Check oil level in the oil tank • Check level sensor • Check for leakage in system When problem is corrected, press "reset" to clear the error	
Error CO_2 (No CO_2 supply)	• Check the CO_2 supply line • Open the CO_2 supply • Check filter on supply line When problem is corrected, press "reset" to clear the error.	

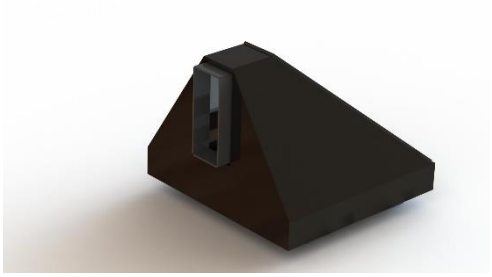
STORING DRY ICE PELLETS

Dry ice is normally fed into insulated boxes, directly into the hopper of a blaster or feeds directly into a process line.

OPTIMIZING PRODUCTION OUTPUT

A dry-ice hood can be used to minimize sublimation during production. The hood is mounted onto the outlet of the Pelletizer and to an insulated box. This reduces sublimation losses by up to 10%. Furthermore, the ingress of humidity is reduced.

Part number : PE800001

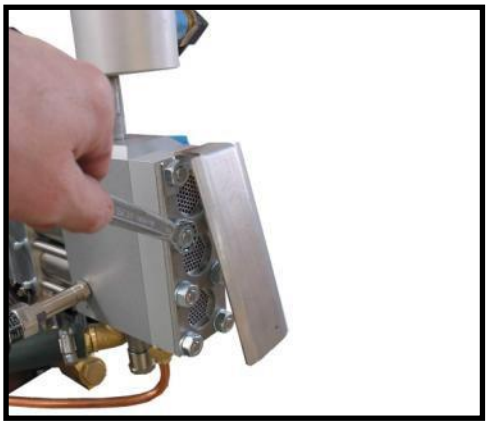


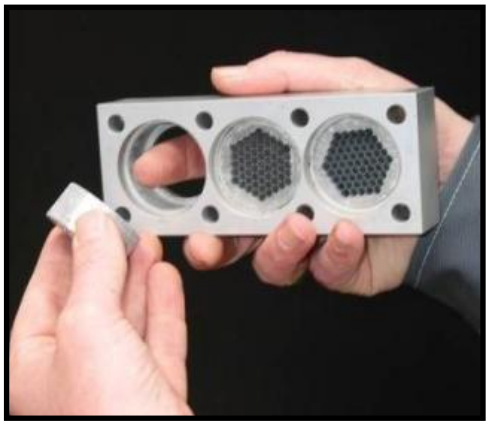
CHANGING EXTRUSION PLATES

To change or replace the extrusion plates first ensure that the machie is off, and that it has heated up to handle. Do not do this directly after operation. Remove the 10mm nuts in front of the press chamber, with a 17mm spanner. Note that the nuts can become very tight if they were fitted when the material was very cold. Keep the nuts lubricated.

Simply push out the individual dies towards the back of the plate.

When making 8-16 mm pellets, fit the plug holder frame in front of the press chamber by using the retaining nuts.





DEGASSING HOSE

A degassing hose should be connected to the PE 80. It is important that the right length has been chosen to fit the customer. In order to standardize Cold Jet offers four length of degassing hoses in the following lengths:

Degassing hose 3 m	2N0734
Degassing hose 5 m	2N0735
Degassing hose 10 m	2N0736
Degassing hose 15 m	2N0737

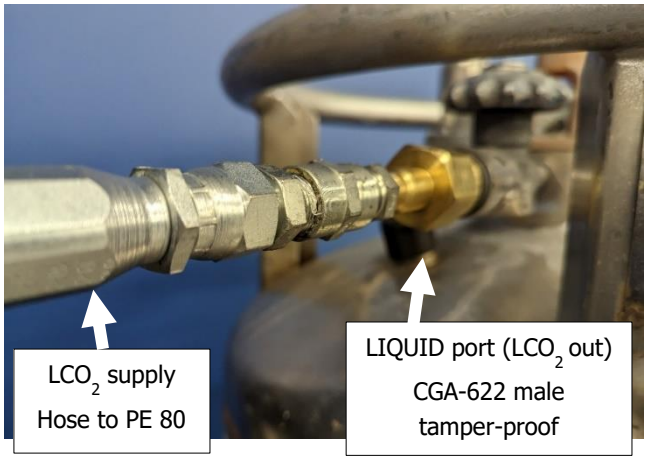
LIQUID CO_2 "DEWARS"

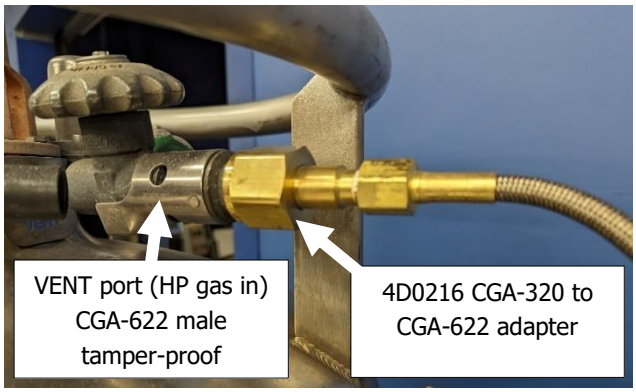
The PE 80 pelletizer can be connected to a LCO2 cylinder (commonly referred to as a "dewar") using a LCO2 supply hose and fittings. Cold Jet makes the below recommendations for the LCO2 dewar specifications, but it is the responsibility of the customer to confirm with their chosen LCO2 supplier:

- Designed and built to Compressed Gas Association (CGA) standards.
- The liquid and vent ports should be fitted with CGA-320 style tamper-proof male threaded fittings.
- Use Food Grade CO2 only.
- Recommended nominal internal pressure of 21 bar (300 psi).

When using a LCO2 dewar the PE 80 pelletizer may generate a "low CO2 pressure" error and shut down when the incoming pressure drops below 13 bar (188 psi). To maintain adequate pressure and optimize consumption of the dewar's available LCO2, a separate high pressure CO2 food-grade gas cylinder may be used. Cold Jet emphasizes the importance of safe and responsible handling of these high-pressure CO2 cylinders and it is the customer's responsibility to consult with their gas supplier on proper installation or maintenance. Mishandling or improper use can lead to serious injuries or property damage. Always prioritize safety and exercise extreme caution when handling these high-pressure CO2 cylinders.

Setup of the 'dewar' system





AUTOMATION

Power supply protection system
An automatic relay stops the Pelletizer and displays a message in the display if the voltage is too low, the phases' order is wrong or a phase is missing.

Pressure protection system
The pressure protection system will stop injection of liquid CO_2 to the Pelletizer if the pressure in the revert gas outlet rises above 0.8 bar/11.6 psi. This means that the production of dry ice stops if the gas blow-off becomes blocked for some reason.
Note that this will also occur if the Recovery Unit is connected physically but is not powered up since its blow-off will be inactive.

Automatic stops when supply of liquid CO_2 from tank is closed
See also note above re shutdown procedure.

MAINTENANCE

No unauthorized or untrained individuals should access the interior of the machine - it can lead to physical injury or damage to property.

The electrical and CO_2 supply must be switched off and disconnected before maintenance work begins. If there is, during the maintenance work, a need for either power or CO_2 supply, it can be connected during the task, provided the necessary protective equipment is used and there is sufficient ventilation.

The equipment requires a minimum of user-maintenance. Active maintenance by authorized specialist is only necessary if the performance of the Pelletizer is no longer satisfactory. However, planned preventative maintenance is recommended.

Maintenance intervals

Planned preventative maintenance should be carried out to ensure long-term reliability.

	Every 3 months or 600 hours	Every 6 months or 1200 hours	Every 12 months or 2400 hours	Every 24 months or 4800 hours
Inspection of extrusion dies	x	x	x	x
Visual inspection of hoses and hose clamps	x	x	x	x
Inspection/change of liquid CO_2 inlet filter	x	x	x	x
Check oil level main pump		x	x	x
Oil level reduction gear		x	x	x
Inspection of gas separator		x	x	x
Change of extrusion filters		x	x	x
Inspection of valve heads injection		x	x	x
Inspection of valve heads valve arrangement		x	x	x
Oil change main oil pump			x	x
Oil change reduction gear			x	x
Replacement of valve heads - if needed			x	x
Function test of motor protection devises			x	x
Function test of automatic fuses			x	x
Replace slider bearing with oil wiper			x	x
Replace front slider bearing			x	x
Inspection of all wire connections				x
Inspection of all Pipe/hose connections				x
Inspection of liquid CO_2 hose				x

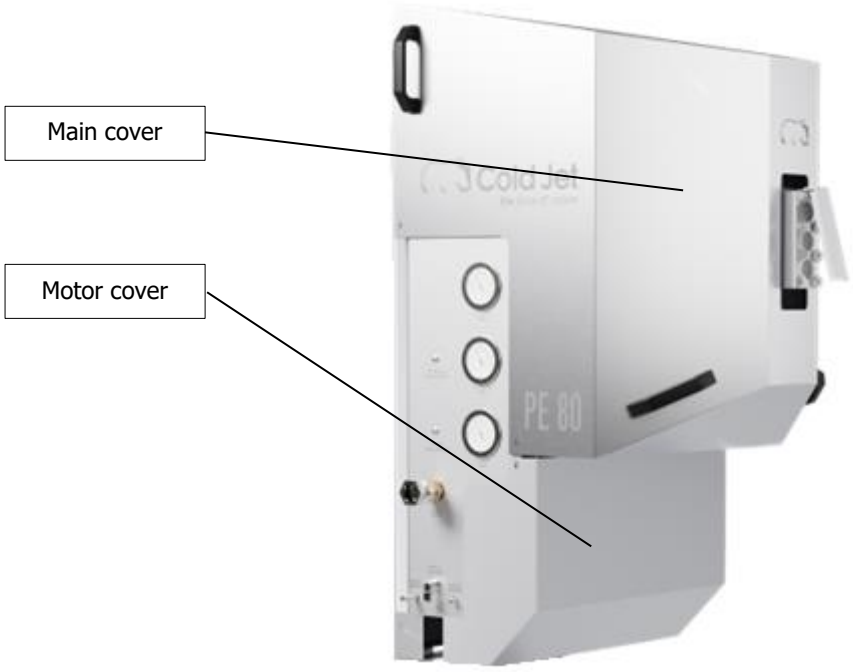
Caution:

Before any service or maintenance actions, depressurize and turn off power supply.

If the machine has been running, then allow it to return to ambient temperature before performing service!

Removing the cover and identification of main components

Turn of the power supply before taking of the cover. The PE 80 consists of two parts: Main cover and motor cover at the bottom of the unit. The cover is bolted at each side.



Checking oil level (main oil pump)

Oil levels are monitored by the PE 80 controller but should be checked at least once or twice a year.
For oil refill use Oil type: Castrol Optileb GT 460
N.B.: To discard used oil please check safety sheet for the Castrol Optileb GT 460 for correct disposal.

Checking oil level (gearbox)
An oil expansion vessel, serving the gearbox, is located at the rear left side of the Pelletizer.
It should be possible to see some oil within the transparent tube leading to the
expansion vessel when the engine has obtaining working temperature, approx. 50º C/122º F.

Dismantling and inspecting the solenoid valves
A solenoid valve is a valve that opens using an electrical coil. By magnetism the spring activated anchor is dragged from the seat internally in the valve and CO_2 gas or liquid can pass through. The Pelletizer type PE 80 uses two types of solenoid valves.

To inspect and renew the first type of valve, the type serving the main chamber please follow the instructions below: Close the CO_2 liquid supply valve at the vessel and run the Pelletizer to remove pressure from the system (allow to stop automatically). Check that the main chamber manometer moves to show zero pressure.

If after having closed the valve on the CO_2 vessel and while the Pelletizer PE 80 is still running, the pressure does not drop and then wait for approximately 10 minutes. Re- start and check if pressure will then drop. If not then wait a further 10 minutes before restarting.

The solenoid coil is simply levered off with a screwdriver, and then the retaining nut holding the valve in place, can be undone by first loosening with a 27mm spanner followed by removal by hand.

Beware: if the manometer is already showing zero, this may be because dry ice has blocked the pressure sensor. If the nut is tight, it may mean that there is hazardous pressure within the chamber that can eject the solenoid valve at dangerously high speed. Stop loosening and remove pressure from the system before proceeding.

Withdraw the solenoid valve from the chamber housing and check the nozzle inlet for dry ice, and valve seat for damage. If dry ice blockage is found, leave it to sublimate away. If damage is found, replace the valve assembly.

If the valve has to be renewed, which is very rare, it is generally only the valve body along with the anchor and the gasket between the valve body and the main chamber.

The nozzle and the coil do not generally need renewal. If the gasket sticks to the main chamber then make sure not to damage main chamber.

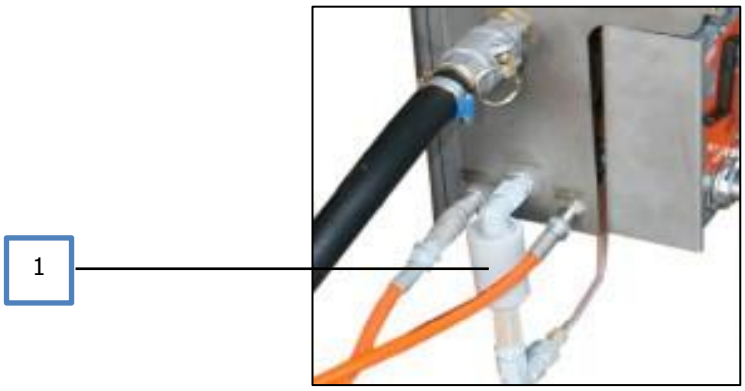
It is very important that the surface under the gasket is smooth and intact.

Refit the (new) valve body with the spring activated anchor. Be careful not to damage the aluminum thread do not use excessive force.

Tighten the valve nut to approximately. 50Nm (5kpm or 37 lb.ft.). Refit the solenoid coil.

Inspection and renewal of inlet filter

For protection of the interior mechanical parts in the Pelletizer a filter (see 1) is mounted on to the machine for liquid CO_2 supply. The filter is mounted together with a check valve to prevent CO2 flowing out of the Pelletizer.

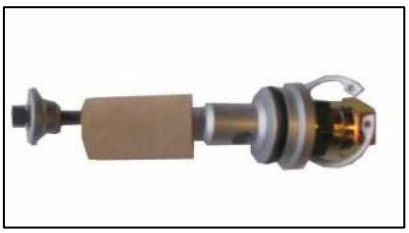


1. The hose for liquid CO_2 supply must be empty and depressurized before inspection.
2. Dismantle the filter and hose from the Pelletizer.

3. The lid of the filter is locked by a circlip. Use a pair of proper circlip pliers: be careful, not to damage the retaining ring.
4. The filter can be pulled out of the housing unit (it is a tight friction fit). The filter is made of sintered bronze, therefore dirt and grease can build up both on the inside and outside of the filter. The dirt and grease found on the outside of the filter can be cleaned off quite easily using a soft cloth. To remove dirt and grease on the inside of the filter try and blow through the filter. If this works the filter can be reused, if the filter is still blocked after doing this, it will have to be replaced with a new one.
5. The screw in the end of the filter is dismantled in order to change the sintered bronze.

6. Renew the O-ring if necessary.
7. Add a thin layer of oil to the outer of the O-ring. This will ease the refitting of the filter in the housing and give some protection of the O-ring.

8. Put the filter back into the housing unit. Make sure that the retaining ring is pressed in place. If the retaining ring is not properly mounted the filter, then the filter will separate when pressurized. This can be dangerous for people standing nearby.



Inspection of the gas separator

The gas separator is located on top of the main chamber and separates CO_2 gas from liquid CO_2. Gas is evacuated from the top of the separator by a solenoid valve. Liquid from the bottom is fed to the main chamber. A level sensor is used to ensure that the main chamber is continuously flooded with liquid CO_2.

The gas separator is opened using following procedure.

- Make sure that that the Pelletizer is depressurized.
  N.B.: This is very important; otherwise the lid can blow off.

- Loosen the nuts from the piping and use circlip pliers to remove the retaining ring

- The lid can be lifted off. The gas separator plate and the level sensor can be seen inside. Take care when the lid and the retaining ring are reassembled. It is very important that the retaining ring is mounted correctly in to the slot. Otherwise the lid will be blasted off the gas separator when pressurized.
- Refit the nuts to the brass tee. Make sure that the side of the tee containing the nozzle is connected to the piping off the solenoid valve.

Inspection of CO_2 liquid supply and level sensor

The level sensor is used to control the supply of liquid CO_2 to the gas separator. Liquid CO_2 is only supplied when the level of liquid in the gas separator is low. A blue light indicates that the level of liquid CO_2 in the separator is at the same level as the sensor.

During dry ice production the blue light will go on and off at short intervals. If blue light does not light up during a period of approximately 5 minutes, then the supply of liquid CO_2 is insufficient.

Terms of warranty

In order to comply with the terms of the warranty, and for safety reasons, repairs other than those stated above require relevant tools and equipment and therefore must always be made either by a Cold Jet technician or by the owner's qualified personnel who has been trained by Cold Jet in the repair and maintenance of Cold Jet dry ice blasting and dry ice production machines and accessories. Beyond the necessary knowledge, the person concerned must have appropriate tools and equipment, as well as the auxiliary materials required, at their disposal.

The liability of the manufacturer under the terms of the CE endorsement as regards to safety may become **invalid:**

- If repairs are made using non- Cold Jet spare parts.
- If repairs are made by unqualified personnel.
- If repairs are unsatisfactory due to lack of relevant tools and equipment.

In such cases, the liability of the manufacturer will be solely confined to any manufacturing faults/errors made prior to the machine being delivered and before repairs/replacements have been made.

Cleaning and storage

Cleaning

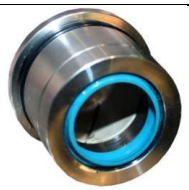
If the equipment has become dirty, clean by means of a wiper moistened with a cleaning material (degreaser) suitable for stainless steel. Do not pressure wash.

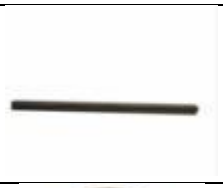
Storage

The equipment can be stored in temperatures of - 5°C to +40°C (23-104° F). Please note, that temperature changes (e.g. overnight) of >20°C (68° F) might cause condensation (dew) inside the electronics, which can cause damage to the equipment.

If condensation is suspected then place the equipment in a warm room (+15° C to +22°C/59-72° F) for 1 hour before use.

SPARE PARTS LIST

Part No.	Description	Image
02150300	Slider bearing oil wiper complete	
33151201	Washer, copper for valve arrangement	
33151203	Washer, copper for the main chamber	
33272503	O-ring 25x3 mm for the inlet filter	
PE 8003330	Sintered bronze filter for the inlet filter	
34422201	Solenoid valve body	
21401001	Level sensor type LBFS 01121	

Part No.	Description	Image
4639224	Safety valve ¼" 24.1 bar	
02800101	Special tool for mounting and dismounting pressure chamber	
11722001	Thread piece M10x238 mm	
33273202	O-ring 32x2.5 mm. For the main chamber	
33274002	O-ring 40x2 mm For the main chamber	
PE 8003322	Sintered filter	
02167202	Reinforcement ring for sintered filter	

TROUBLESHOOTING

It is very important that the equipment should be maintained and operated as stipulated in this manual.

However, if a breakdown should occur, the following scheme can be used for troubleshooting.

Always ensure that the system has been appropriately shut down, de-energized, and de-pressurized before attempting troubleshooting.

- NB: For all ice-formation and blockage problems internal to the Pelletizer; if time allows, a 15-20 minute break in production to allow the ice block to warm up and sublime will typically solve the problem.
- The tank pressure must be above 13 bar/189 psi. Lower pressure can cause formation of dry ice blockage. Watch out for pressure loss in the piping from the storage tank.
- During production is it important that the supply of liquid CO_2 is sufficient. See section 6.8. Inspection of CO2
- Liquid supply and level sensor.
- The pressure on the liquid CO_2 in the Pelletizer is controlled electrically and can be read on the pressure gauge. Du ring standby the pressure is designed to be between 11-16 bar (160-232 psi) and during production of dry ice to be between 11-13 bar (160-189 psi) during production of dry ice.
- The production of dry ice is controlled by solenoid valves opening and closing at short intervals.

Problem	Cause	Solution
No power	Power is not connected	Check for defects on the power connection
Motor failure (Motor protection error) Power supply failure (power supply error)	Thermal cut-out operated caused by overloaded motor.	Reset the thermo relay for the motor in the main electrical panel. Check that the set point corresponds with setting on the motor. Check crank house for over- heating due to overloaded bearings, if lubrication has not been maintained.
	Phase direction is wrong	Turn the phase inverter in the socket with a screwdriver, or consult an electrician.
	Low voltage. The voltage on the power supply has to be with-in 10% of the nominal voltage.	Check power supply. Measure voltage at the equipment.
No Pellets	No gas from vessel.	Check that vessel liquid valve is open
	Low pressure at vessel.	Increase pressure to above 13 bar (189 psi) using the pressure building system in the tank
	Pelletizer CO_2 control is set too low.	Increase CO_2 volume for gas/pellets.
	Blockage of the main gas blow- off from the Pelletizer. If the gas	Shut down system and wait for the blockage to sublime. Check that there are no bends on the

Problem	Cause	Solution
	cannot escape from the Pelletizer the pressure will rise and the Pelletizer will stop production of dry ice.	hose so that the gas can flow freely.
	Ice blockage inline (low pressure showing at press chamber mano-meter), usually due to over-fast opening of the liquid valve at the vessel on start-up.	Check the solenoid valves. Are they opening, are they worn or are they blocked by impurities.
	Insufficient supply of liquid CO_2. No blue light on level indicator LS262	Check if the valve on the tank is fully open. Check if the filter or the hose is blocked
	The pressure as indicated on the pressure gauge is above or below the pressure ranges (standby: 11- 16 bar/160-232 psi and operation: 11-13 bar/160-189 psi). Low pressure can result in formation of dry ice blockage internally. High pressure can be causing shooting of dry ice pellets and blockage.	Check the solenoid valves. Are they opening, are they worn or are they blocked by impurities
Pellet production stops at 1 or 2 extrusion plate outlets	Insufficient supply of liquid CO_2. No blue light on level indicator during production	See above regarding insufficient supply of liquid.
	Blockage of the main gas blow- off from the Pelletizer.	See above.
	Dry ice blockage at the injection nozzle to the non-functioning press chamber(s)	Shut down system and wait for the blockage to sublime.
Pellets shoot out of the outlets during production	Damaged filter or blocked filter in main chamber.	The filter can be blocked by water condensate from the surroundings. Stop and wait for sublimation. The filter can be damaged. Take off the extrusion holder and look into the press chamber. The filter can be seen when the pistons drawn back. The filters must be cylindrical.
	The pressure in the gas separator is out of range.	See above.
Unusual amount of gas is ejected from one of the extrusion plate outlets before the "Start" button is pressed.	Contamination or dry ice on the injection nozzle causes leakage	Dismantle the solenoid valve and make an inspection.

Problem	Cause	Solution
	Damage to the solenoid valve seat(s) is allowing liquid to pass by.	Replace the solenoid valve armature and check the nozzle.

DELIVERY REPORT

Distributor name:	
Owner's name:	
Owner's address:	
Equipment number:	
Extent of Delivery	□ Pelletizer PE 80
	□ 5m/16,5" of 16mm/0.63" hose with 3/8" CO_2 connectors at both ends and an inlet filter assembly
	□ Adaptor for connecting to pressure vessel (optional)
	□ Noise damper for gas outlet
	□ 16 amp 3-phase power cable
Signed (Dealer)	
Date	

Delivery report - to be completed by the owner
□ I have received Operation and maintenance manual for PE 80
The equipment has been delivered to me in a satisfactory condition, and I fully understand that the warranty is for a period of 12 months after the date of delivery. I accept that neglect or misapplication of the equipment, as well as unauthorized modifications or repair shall cause this warranty to be void.
End-user's signature:
Date:
Warranty of the above equipment will not be effective before this form has been completed, properly signed and this original returned within 20 days of delivery to Cold Jet.

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