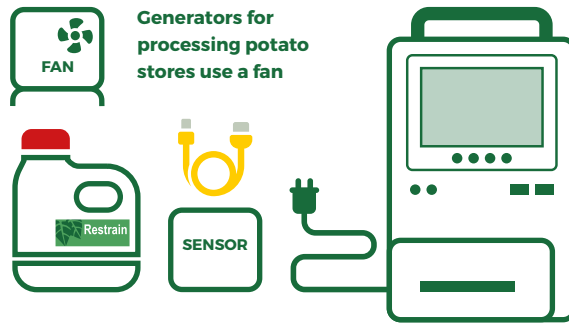


# QUICK START GUIDE

## 1. HAVE YOU GOT EVERYTHING?



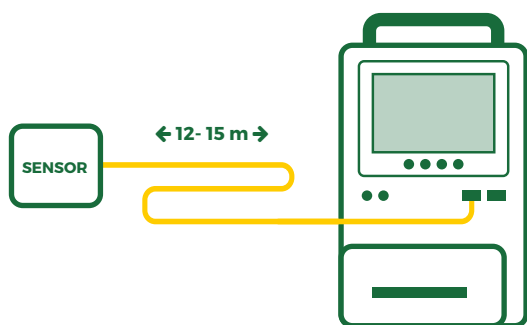
- The Restrain ethylene generator
- The Restrain sensor
- The yellow sensor cable
- Jerry cans of ethanol only required after step 16
- **Save packaging for future use**

## 2. PLACEMENT OF GENERATOR



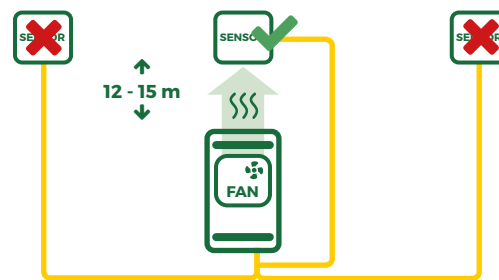
- Place the generator:
  - in the storage area
  - in a dry place
  - with 0.5-meter free space all around
  - **not** in the airflow from the ventilation system, or near a door
- Plug the generator into a 220V 3 pin socket (UK customers: UK Plug adapter supplied)
- If you have a Restrain distribution fan also plug this in to the mains

## 3<sup>a</sup> PLACEMENT OF SENSOR IN TABLE POTATO STORES



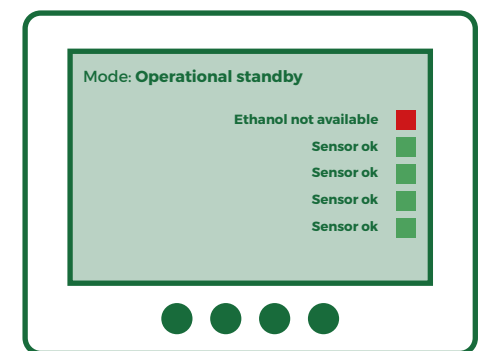
- Connect sensor cable to generator
- Connect sensor to cable
- Place sensor:
  - 12-15m from generator
  - No obstructions between generator and sensor

## 3<sup>b</sup> PLACEMENT OF SENSOR IN PROCESSING POTATO STORES



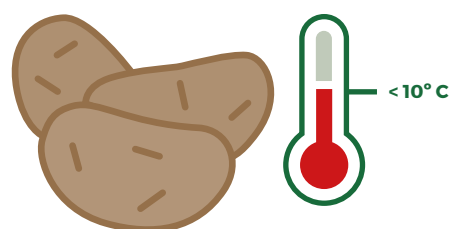
- Restrain generators for processing potato stores use a fan
- Connect sensor cable to generator
- Connect sensor to cable
- Place sensor:
  - 12-15m from generator
  - With the fan blowing air towards the sensor
  - No obstructions between generator and sensor

## 4. EQUIPMENT ON



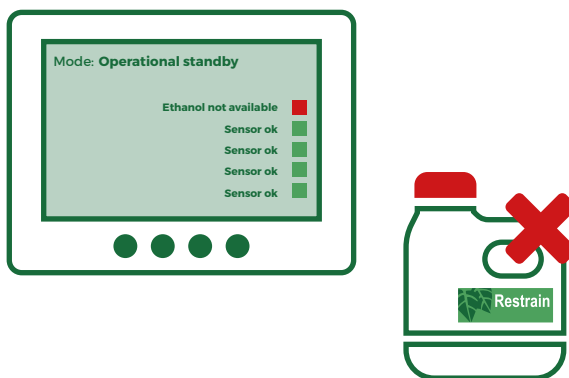
- Generator starts automatically (30 sec.)
- On screen:
  - 1 red light
  - 4 green lights
- Do not connect ethanol yet

## 5. STORAGE CRITERIA



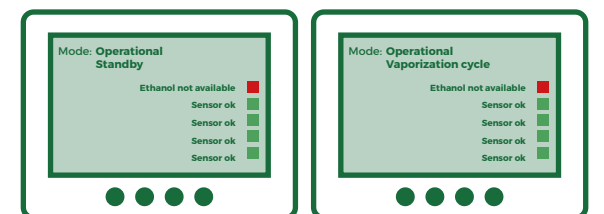
- Potatoes dry
- Potato wounds healed
- Temperature of potatoes constant < 10°C

## 6. THE PRE-START PROGRAM



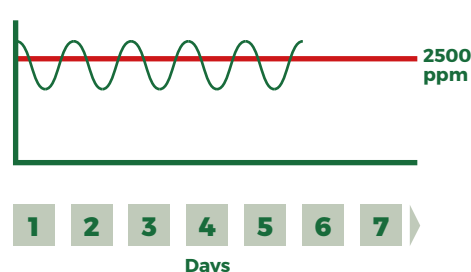
- Goal: To take carbon dioxide readings to confirm respiration rate has settled
- NB: **DO NOT** connect the ethanol
- Every half hour, the generator measures CO<sub>2</sub>, air humidity and temperature in store

## 7. START GENERATOR PRE-START PROGRAM



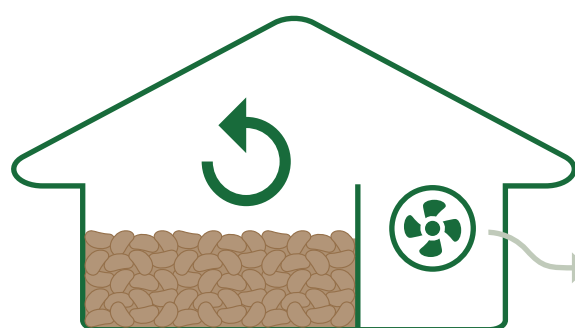
- First, get in touch with your Restrain contact for the startup protocol, then:
  - Choose **Select Vaporization cycle**
  - Choose agreed startup protocol
  - Choose **Start - Setup menu**
  - Choose **Start** again
- Successful? At the top of the screen: **Mode: Operational Vaporization Cycle**

## 8. MONITORING CO<sub>2</sub>



- Allow program to run **7 days** for correct readings to be obtained
- Generator measures CO<sub>2</sub> level in store
- Goal: CO<sub>2</sub> constantly less than 2500 ppm for last 3 days

## 9. INTERNAL VENTILATION



- For correct readings during 7-day pre-start:
  - Activate internal ventilation for 1 hour per day
- CO<sub>2</sub> spreads evenly throughout storage facility

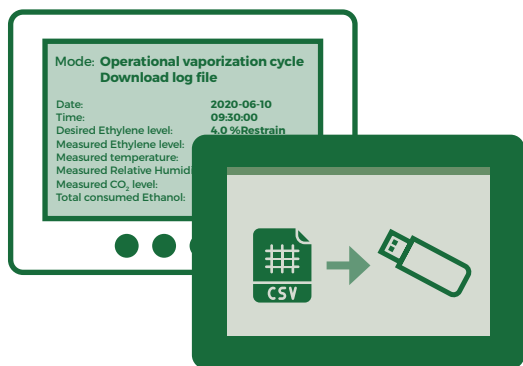
## 10. EXTERNAL VENTILATION



- Open hatches 1 hour per day for external ventilation (immediately after internal ventilation)
- Fresh air in storage facility, and CO<sub>2</sub> level drops

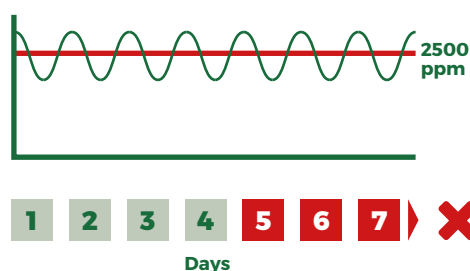
SEE OVER FOR NEXT STEPS.

# 11. MEASURING IS KEY



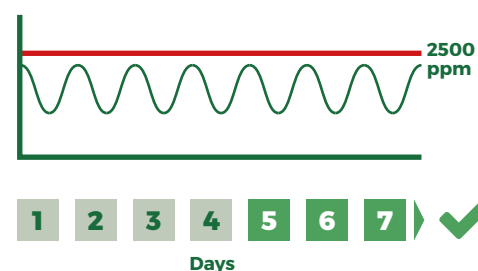
- Check CO<sub>2</sub> readings during and after pre-start:
  - View 'Log File' on generator screen
  - Or download 'Log File' to USB stick
- See manual for instructions

# 12. MONITORING CO<sub>2</sub> - PRE-START NOT SUCCESSFUL



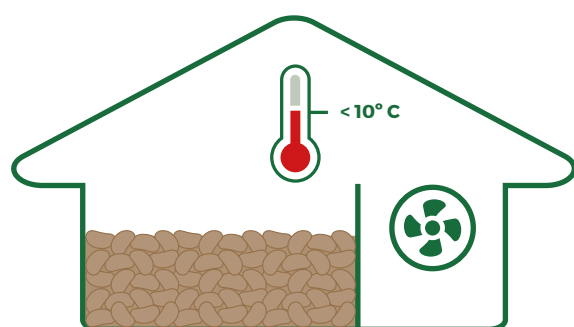
- CO<sub>2</sub> reading rises rapidly after external ventilation
- Readings more than 2500 ppm
- **DO NOT start ethylene treatment. Continue with CO<sub>2</sub> MONITORING - PRE-START**
- Evaluate internal & external ventilation

# 13. MONITORING CO<sub>2</sub> - PRE-START SUCCESSFUL



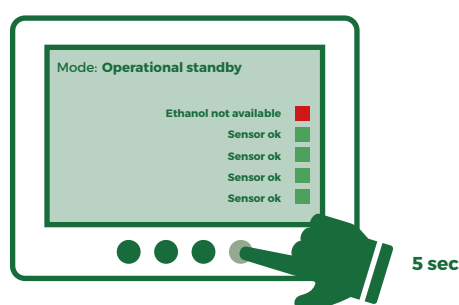
- CO<sub>2</sub> rises slowly after external ventilation and remains less than 2500 ppm
- Pattern repeats itself for at least the last 3 days of 7-day pre-start phase

# 14. RESPIRATION RATE SETTLED



- Check potatoes:
  - Dry?
  - Wounds healed?
  - Constant < 10°C?
  - CO<sub>2</sub> stable at less than 2500 ppm?
- If not: Continue with CO<sub>2</sub> MONITORING - PRE-START

# 15. STOP PRE-START PROGRAM



- Pre-start successful and criteria for previous step fulfilled?
- Terminate pre-start program on generator
- Press **TERMINATE** button for 5 sec.
- On the screen you will see: **'Mode: Operational Standby'**

# 16. PREPARE JERRY CAN OF ETHANOL



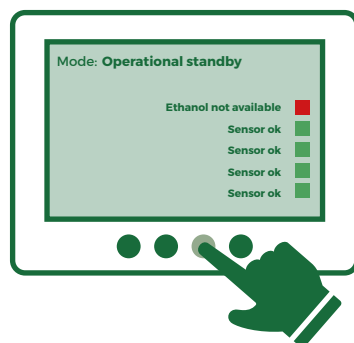
- Wear protective clothing and read safety guidelines
- Place jerry can of ethanol 0.5 meter from your generator
- Unscrew cap of jerry can
- Pierce 2 ø8mm holes in cap (1 for supply hose, 1 air hole)

# 17. CONNECT ETHANOL



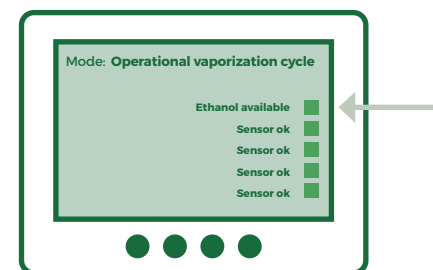
- Remove hose, weights and filter from holder on front of generator
- Insert hose into 1 hole in cap
- Attach weights to end of hose projecting from underside of cap
- Insert filter into hose end
- Insert hose into jerry can, ensuring that filter touches the bottom, and screw cap on again

# 18. START ETHYLENE TREATMENT



- At top of screen: **Mode: Operational Standby**
- Select **Select Vaporization cycle**
- Choose agreed startup protocol
- Select **Start - Setup menu**
- Select **Start**

# 19. CHECK START OF TREATMENT



- At top of screen: **Mode: Operational Vaporization Cycle**
- Generator warms up for 40 min.
- Light next to **'Ethanol available'** on screen turns green when the ethanol in supply hose reaches the pump
- Ethylene treatment has started

# 20. RESTRAIN IS ACTIVE



- Generator increases concentration of ethylene in steps to the desired Restrain level
- This takes 3 weeks
- After that, the generator keeps the concentration stable
- Ethylene keeps potatoes dormant and counteracts germination
- Check status of equipment and potatoes daily

## STORAGE MANAGEMENT CHECKLIST

DAILY CHECKS	SAFETY GUIDELINES
<b>Generator</b> ✓ All signals green? ✓ No error messages? ✓ CO <sub>2</sub> readings less than 2500 ppm? ✓ Temperature < 10°C ✓ Ethylene level at correct percentage?	Always read instructions for use Minimum storage space for use: 200m <sup>3</sup> Keep 0.5 meter free around generator
<b>Potatoes dormant?</b> <b>Germination blocked and/or brittle?</b> <b>Sufficient ethanol in stock?</b> ✓ At least 2 jerry cans	Ethanol is highly inflammable. ✓ Wear protective clothing ✓ No fire or smoking products ✓ No mobile telephone Ethanol on skin or in eyes? Rinse with water!
	Use only official Restrain ethanol Store reserve jerry cans in locked, fireproof cabinet Rinse out empty jerry cans and dispose as industrial waste No exhaust fumes near sensor Keep generator upright and dry
	Back of generator (outlet) gets hot! ✓ Never open it yourself ✓ After switching off, wait 6 hours before moving



**Contact**  
[www.restrain.io/contact](http://www.restrain.io/contact)