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**SÜD-CHEMIE**  
Creating Performance Technology



**ETHYLENE CONTROL  
FOR THE  
FLOWER MARKET**



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# Ethylene Control

## Sachets, Filters & Filtration Systems

### Purpose

To extend the shelf-life and quality of produce and flowers by absorbing ethylene gas from the air.

### What is it?

Süd-Chemie Performance Packaging offers Ethylene Control products, a full line of sachets, filters and filtration systems designed to absorb ethylene gas, a naturally-occurring ripening agent that causes fruits and vegetables to ripen and decay, and flowers to wilt. In doing so, Ethylene Control products not only slow down the natural decay process of fruits, vegetables and flowers, they also kill molds, rots and odors that threaten the quality of produce and floral goods.

### Why use it?

Researchers have found that there is no "safe" level of ethylene for post-harvest products. Decay, russet spotting, yellowing, odor, scalding and wilting are just a few of the common effects of ethylene exposure.

While ethylene gas is sometimes used under controlled conditions as a ripening agent, such as in grocery stores to cause green bananas to turn yellow or tomatoes to turn red, even small amounts of exposure during shipping or storage can cause most produce to deteriorate at an increased rate. Many fruits and vegetables produce various levels of ethylene themselves during their natural ripening process. Further, the presence of automotive emissions, plastics, smoke and fluorescent lights all increase levels of ethylene gas in the air. The increased ethylene threatens the life-cycle of produce and flowers.

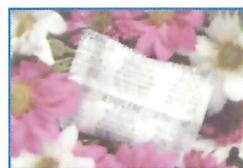
By controlling ethylene gas in the air, users can extend the shelf-life and quality of their products, while also increasing satisfaction and loyalty among customers.

### Available configurations

Ethylene Control products are available in three configurations, depending on application:

**Sachets:** Ethylene Control's Power Pellet Sachets are ideal for protecting individual boxes or cartons of produce and flowers. Large sachets are also effective in protecting reach-ins. One sachet per box protects products continuously, from the packing line to the retail backroom. Sachets are available in 5-, 9- and 28-gram sizes.

**Filters:** Ethylene Control Filters are ideal for use in areas like walk-in coolers and refrigerators, refrigerated trucks and sea



Ethylene Control Power Pellet Sachets



Ethylene Control Filters



Ethylene Control Filtration Systems

### Typical applications:

- ✓ Fruits
- ✓ Vegetables
- ✓ Cut flowers
- ✓ Flowering plants
- ✓ Foilage plants
- ✓ Flowering bulbs



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(Turn over for technical information)

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# Ethylene Control

## Sachets, Filters & Filtration Systems

containers, where they can be mounted anywhere in the air-flow system, oxidizing ethylene gas and killing molds and rots as air passes through the filter. In addition to protecting against ethylene, they reduce odors and retard taste migration. Filters remain active up to three months with produce and up to six months with floral products. Filters are available in two sizes: 18 in. x 7 in. x 2 in. (protecting up to 3,000 cu. ft.) and 18 in. x 20 in. x 2 in. (protecting up to 10,000 cu. ft.).

**EC-3+ Air Filtration System:** Ethylene Control's air filtration system is a self-contained unit holding 100 pounds of Ethylene Control Power Pellets that can effectively lower ethylene gas readings in storage areas between 75,000 and 150,000 cubic feet in size, depending on the commodities being stored. The system reduces ethylene levels by up to 98.9 percent. The pellets also kill mold and rots.

### Usage requirements

Ethylene Control's patented Power Pellets oxidize ethylene gas with nascent oxygen, converting the pellets into manganese dioxide, an organic fertilizer with **no special disposal requirements**. Ethylene Control products are approved for use by the Organic Material Review Institute for use with organic food production. Both packaging materials and inks are FDA compliant for contact with food.

Power Pellet life varies depending on commodity and storage conditions. Contact an Ethylene Control product specialist for complete usage requirements at e-mail [info@s-cpp.com](mailto:info@s-cpp.com).

### Effects of Ethylene Exposure: Flowers

	Rate of Ethylene Production	Rate of Ethylene Sensitivity	Principal Reaction to Exposure
Carnations (Cut)	VL	H	Sleepiness, leaf curl
Roses (Cut)	VL	H	Premature opening
Flower Bulbs	VL	H	Shrink, retards flower formation
Nursery Stock	VL	H	Slower start

### Effects of Ethylene Exposure: Fruits & Vegetables

	Rate of Ethylene Production	Rate of Ethylene Sensitivity	Principal Reaction to Exposure
Apples	VH	H	Scald, lose crunch
Apricots	H	H	Decay
Asian Pears	H	H	Decay
Asparagus	VL	M	Toughness
Avocados	H	H	Decay
Bananas	M	H	Decay
Berries	VL-L	L	Mold
Broccoli	VL	H	Yellowing
Brussels Sprouts	VL	H	Yellowing
Cantaloupe	H	M	Decay
Carrots	VL	L	Bitterness
Chard	VL	H	Decay
Cherimoya	VH	H	Decay
Cherries	VL	L	Softening
Cucumbers	L	H	Yellowing
Grapefruit	VL	M	Mold
Grapes	VL	L	Mold
Kiwi Fruit	L	H	Decay
Lemons, Limes	VL	M	Mold
Lettuce, Leafy Greens	VL	H	Russet spotting
Mangoes	M	H	Decay
Melons (Crenshaw, Honeydew, Persian)	M	H	Decay
Nectarines	H	H	Decay
Onions, Garlic	VL	L	Odor, sprouting
Oranges	VL	M	Mold, rind breakdown
Papaya	H	H	Decay
Passion Fruit	VH	H	Decay
Peaches	H	H	Decay
Pears (Anjou, Bartlett, Bosc)	H	H	Decay
Persimmons	L	H	Decay
Plums, Prunes	M	H	Decay
Potatoes (Processing, Seed)	VL	M	Sprouting
Quinces	L	H	Decay
Tomatoes	M	H	Shrink, decay
Watermelons	L	H	Loss in firmness

VL = Very Low L = Low M = Moderate H = High VH = Very High

Source: Fresh Produce Manual for 1997 from the Produce Marketing Association and the 1991 Sea Land Shipping Guide for Perishables

## Industry Profiler:

# Produce & Floral

## Products & Applications:

### Ethylene Control



Produce, flowers and other perishable goods require special care during storage and transport. Exposure to naturally-occurring gases like ethylene can cause premature ripening or decay, while unexpected shipping delays or weather changes can cause mold, mildew and other costly losses. Süd-Chemie Performance Packaging offers numerous options to protect perishable goods during shipping and storage.

### Ethylene Control

Süd-Chemie offers a full line of Ethylene Control products that protect produce and flowers from the harmful effects of ethylene, a naturally-occurring gas that causes fruits and vegetables to ripen and decay and flowers to wilt.

While ethylene gas is sometimes used under controlled conditions to encourage the ripening of fruits and vegetables, such as in grocery stores to turn green bananas yellow, even small amounts of exposure can cause most produce to deteriorate at an increased rate. Ethylene gas is naturally produced by fruits and vegetables during the natural ripening process. Furthermore, automotive emissions, plastics, smoke and fluorescent lights all cause ethylene levels to increase. Decay, russet spotting, sprouting, yellowing, scalding and wilting are just a few of the common effects of ethylene exposure.

Application-specific Ethylene Control solutions include:

**Sachets:** For use with individual boxes of produce or flowers, as well as reach-ins. Available in 5-, 9- and 28-gram sizes.

**Filters:** For use in walk-in coolers and refrigerators, refrigerated trucks and sea containers. Sizes include: 18 in. x 7 in. x 2 in. (for areas up to 3,000 cu. ft) and 18 in. x 20 in. x 2 in. (for areas up to 10,000 cu. ft).

**Filtration Systems:** For storage areas ranging in size from 75,000 to 150,000 cubic feet.

### Container Dri® II



Ethylene Control products are also effective at killing molds, rots and odors.

### Container Dri® II and Container Dri® II Strip

Süd-Chemie's Container Dri II helps protect perishables from the damaging effects of moisture during their journeys over land or sea. Through a special formula, Container Dri II removes moisture from the air, thereby decreasing dew point temperature, or the temperature at which condensation begins to form, causing "container rain." The lack of humidity and condensation means goods can stay fresher, safer, longer – without becoming dried-out themselves.

The only bagged container desiccant on the market available with an adhesive backing, Container Dri II can absorb nearly 300 percent of its weight in water, trapping it as a no-spill gel. Container Dri II Strip (strips of six bags each) fits perfectly between the corrugated grooves of shipping containers, safe from cargo and forklifts.

Container Dri II protects shipments from start to finish, through all temperature ranges and relative humidity variances. Made of completely safe, non-toxic materials, it can be disposed of as regular waste.

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Creating Performance Technology



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**PRODUCT SHEET**

(Size & Weight)

SACHETS (Class 50) HARMONY #2530.90.0015	- 5 gram	- 1 case	= 2,000 (4 @ 500) = 1.6 ft. cubed (14"x 14"x 14") = 30 lbs. Gross Weight
	- 9 gram	- 1 case	= 2,000 (4 @ 500) = 1.6 ft. cubed (14"x 14"x 14") = 50 lbs. Gross Weight
	- 28 gram	-1 case	= 1,000 (1 @ 1,000) = 1.6 ft. cubed (14"x 14"x 14") = 65 lbs. Gross Wt.
	-28 gram/ 10 pack	-1 case	= 70 10-packs = 2.22 ft. cubed (19 ¼"x 16 ¼" x 14 ¾) = 58 lbs. Gross Weight
FILTERS (Class 70) HARMONY #2530.90.0015	- 18"x 7"x 2"	- 1 case	= 10 filters = 2.22 ft. cubed (19¼"x 16¼"x 14¾") = 50 lbs. Gross Weight
	- 18"x 20"x 2"	- 1 case	= 5 filters = 3.36 ft. cubed (21½"x 19¼"x 16¾") = 70 lbs. Gross Weight
2 LB. BLANKET HARMONY #2530.90.0015	- 12"x 9½"	- 1 case	= 10 blankets = .75 ft. cubed (10"x 10"x 10") = 28 lbs. Gross Weight
POWER PELLETS (Class 50) HARMONY #2530.90.0015		- 1 pail	= 50 lbs. Net Weight = 1.66 ft. cubed (17" ht. x 12" dia.) = 55 lbs. Gross Weight
EC-3+ FILTRATION SYSTEM (Class 85) HARMONY #8421.39		- 1 unit	= 12.86 ft. cubed (23"x 23"x 42") = 110 lbs. Gross Weight

Note: Size & weight information does not include pallet  
that may be necessary for shipping.

## ETHYLENE PRODUCTION / SENSITIVITY CHART

COMMODITY	RECOMMENDED TEMPERATURE SETTING		ETHYLENE PRODUCTION RATE	SENSITIVITY TO ETHYLENE ACTION
	C	F		
<b><u>FRESH FRUIT &amp; VEG.</u></b>				
Apple (non-chilled)	1.1	30	VH	H
Apple (chilled)	4.4	40	VH	H
Apricot	-0.5	31	H	H
Artichoke - Globe / Jerusalem	0.0	32	VL	L
Asian Pear	1.1	34	H	H
Asparagus	2.2	36	VL	M <i>(Toughness)</i>
Avocado -California	3.3	38	H	H
-Tropical	10.0	50	H	H
Banana	14.4	58	M	H
Beans -Lima	0.0	32	L	M
-Snap / Green	7.2	45	L	M
Belgian Endive	2.2	36	VL	M
Berries -Blackberry	-0.5	31	L	L <i>(Mold)</i>
-Blueberry	-0.5	31	L	L <i>(Mold)</i>
-Cranberry	2.2	36	L	L <i>(Mold)</i>
-Currants	-0.5	31	L	L <i>(Mold)</i>
-Dewberry	-0.5	31	L	L <i>(Mold)</i>
-Elderberry	-0.5	31	L	L <i>(Mold)</i>
-Gooseberry	-0.5	31	L	L <i>(Mold)</i>
-Loganberry	-0.5	31	L	L <i>(Mold)</i>
-Raspberry	-0.5	31	L	L <i>(Mold)</i>
-Strawberry	-0.5	31	L	L <i>(Mold)</i>
Breadfruit	13.3	56	M	M
Broccoli	0.0	32	VL	H <i>(Yellowing)</i>
Brussel Sprouts	0.0	32	VL	H
Cabbage	0.0	32	VL	H
Cantaloupe	4.4	40	H	M
Cape Gooseberry	12.2	54	L	L
Carrots- topped	0.0	32	VL	L <i>(Bitterness)</i>
Casaba Melon	10.0	50	L	L
Cauliflower	0.0	32	VL	H
Celery	0.0	32	VL	M
Chard	0.0	32	VL	H
Cherimoya	12.8	55	VH	H
Cherry -Sour	-0.5	31	VL	L <i>(Softening)</i>
-Sweet	-1.1	30	VL	L <i>(Softening)</i>
Chicory	0.0	32	VL	H
Chinese Gooseberry	0.0	32	L	H
Collards	0.0	32	VL	M
Crenshaw Melon	10.0	50	M	H
Cucumbers	10.0	50	L	H <i>(Yellowing)</i>
Eggplant	10.0	50	L	L
Endive (Escarole)	0.0	32	VL	M
Feijoa	5.0	41	M	L
Figs	0.0	32	M	L
Garlic	0.0	32	VL	L <i>(Odor)</i>
Ginger	13.3	56	VL	L

N = NONE  
VL = VERY LOW

L = LOW  
M = MEDIUM

H = HIGH  
VH = VERY HIGH

## ETHYLENE PRODUCTION / SENSITIVITY CHART

COMMODITY	RECOMMENDED TEMPERATURE SETTING		ETHYLENE PRODUCTION RATE	SENSITIVITY TO ETHYLENE ACTION	
	C	F			
<b><u>FRESH FRUIT &amp; VEG.</u></b>					
Grapefruit - AZ/CA/FL/TX	13.3	56	VL	L	<i>(Mold)</i>
Grapes	-1.1	30	VL	L	<i>(Mold)</i>
Greens (Leafy)	0.0	32	VL	H	<i>(Russet Spotting)</i>
Guava	10.0	50	L	M	
Honeydew	10.0	50	M	H	
Horseradish	0.0	32	VL	L	
Jack Fruit	13.3	56	M	M	
Kale	0.0	32	VL	M	
Kiwi Fruit	0.0	32	L	H	
Kohirabi	0.0	32	VL	L	
Leeks	0.0	32	VL	M	
Lemon	12.2	54	VL	M	<i>(Mold)</i>
Lettuce -Butterhead	0.0	32	L	M	<i>(Russet Spotting)</i>
-Head / Iceberg	0.0	32	VL	H	<i>(Russet Spotting)</i>
Lime	12.2	54	VL	M	<i>(Mold)</i>
Lychee	1.7	35	M	M	
Mandarine	7.2	45	VL	M	
Mango	13.3	56	M	H	
Mangosteen	13.3	56	M	H	
Mineola	3.3	38	L	L	
Mushrooms	0.0	32	L	M	
Nectarine	-0.5	31	H	H	
Okra	10.0	50	L	M	
Olive	7.2	45	L	M	
Onions -Dry	0.0	32	VL	L	<i>(Odor)</i>
-Green	0.0	32	VL	M	
Orange -CA/AZ	7.2	45	VL	M	
-FL/TX	2.2	36	VL	M	
Papaya	12.2	54	H	H	
Paprika	10.0	50	L	L	
Parsley	0.0	32	VL	H	
Parsnip	0.0	32	VL	L	
Passion Fruit	12.2	54	VH	H	
Peach	- 0.5	31	H	H	
Pear -Anjou / Bartlett / Bosc	- 1.1	30	H	H	
-Prickley	5.0	41	N	L	
Peas	0.0	32	VL	M	
Pepper -Bell (Sweet)	10.0	50	L	L	
-Chili	10.0	50	L	L	
Persian Melon	10.0	50	M	H	
Persimmon -Fuyu	10.0	50	L	H	
-Hachiya	0.5	41	L	H	
Pineapple	10.0	50	L	L	
-Guava	5.0	41	M	L	
Plantain	14.4	58	L	H	
Plum / Prune	-0.5	31	M	H	
Pomegranate	5.0	41	L	L	

N = NONE  
VL = VERY LOW

L = LOW  
M = MEDIUM

H = HIGH  
VH = VERY HIGH

## ETHYLENE PRODUCTION / SENSITIVITY CHART

COMMODITY	RECOMMENDED TEMPERATURE SETTING		ETHYLENE PRODUCTION RATE	SENSITIVITY TO ETHYLENE ACTION		
	C	F				
<b><u>FRESH FRUIT &amp; VEG.</u></b>						
Potato	-Processing	10.0	50	VL	M	<i>(Sprouting)</i>
	-Seed	4.4	40	VL	M	
	-Table	7.2	45	VL	M	
Pumpkin		12.2	54	L	L	
Quince		-0.5	31	L	H	
Radishes		0.0	32	VL	L	
Red Beet		2.8	37	VL	L	
Rambutan		12.2	54	H	H	
Rhubarb		0.0	32	VL	L	
Rutabaga		0.0	32	VL	L	
Sapota		12.2	54	VH	H	
Spinach		0.0	32	VL	H	
Squash	-Hard Skin	12.2	54	L	L	
	-Soft Skin	10.0	50	L	M	
	-Summer	7.2	45	L	M	
	-Zucchini	7.2	45	N	N	
Star Fruit		8.9	48	L	L	
Swede (Rutabaga)		0.0	32	VL	L	
Sweet Corn		0.0	32	VL	L	
Sweet Potato		13.3	56	VL	L	
Tamarillo		0.0	32	L	M	
Tangerine		7.2	45	VL	M	
Taro Root		7.2	45	N	N	
Tomato	-mature / green	13.3	56	VL	H	
	-Brkr / Lt Pink	10.0	50	M	H	
Tree	-Tomato	3.9	39	H	M	
Turnip	-Roots	0.0	32	VL	L	
	-Greens	0.0	32	VL	H	
Watercress		0.0	32	VL	H	
Watermelon		10.0	50	L	H	
Yam		13.3	56	VL	L	
<b><u>Live Plants</u></b>						
Cut Flowers	-Roses	0.0	32	VL	H	<i>(Opens Sooner)</i>
	-Chrysanthemums	0.0	32	VL	H	
	-Gladioli	2.2	36	VL	H	
	-Carnations	0.0	32	VL	H	<i>(Sleepiness)</i>
Potted Plants		-2.8 / 18.3	27 / 65	VL	H	
Nursery Stock		-1.1 / 4.4	30 / 40	VL	H	<i>(Slower Start)</i>
Christmas Trees		0.0	32	N	N	
Flower Bulbs	-Bulbs / Corms / Rhizomes / Tubers	7.2 / 15	45 / 59	VL	H	

N = NONE  
VL = VERY LOW

L = LOW  
M = MEDIUM

H = HIGH  
VH = VERY HIGH

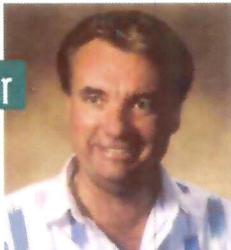
# Fresh

## PERSPECTIVES

*Newsletter of Ethylene Control, Inc.*

### President's Corner

We are expecting great things for growers in 2004 as many of the commodities begin a strong return after some slow years.



We are equipped to provide packers, shippers and end-users with a product that puts dollars on the positive side of your bottom line. Let us help you with your premature ripening and mold problems.

Sincerely,

*Dave Biswell*  
Dave Biswell

## EC packs accompany The Flower Market bouquets

The Flower Market is a value-added operation that blankets some of the best supermarkets with its well-designed floral bouquets. Headquartered in Calgary Alberta, Canada, The Flower Market has been in business about two decades, reports Glen Roy, warehouse manager.



"Our primary focus is supermarket floral," said Roy. The company ships only to the Canadian marketplace with bouquets in major supermarket chains in Western Canada.

Early on, The Flower Market was mostly wholesale in bulk. However, they discovered that by

designing arrangements and packaging them, they could capture a larger share of the market. So they import the flowers and build bouquets by the thousands.

Roy estimates The Flower Market processes between 30,000 and 35,000 bouquets every month and keeps them fresh in its 15,000 square feet of cooler space.



"Because we ship to supermarkets all over the territory, much of our floral stock is transported through warehouses and put on trucks with a wide variety of other commodities," said Roy. "We found that we were having numerous spoilage claims," he said. "We felt they may be ethylene related issues."

Roy explained that because of many shipments going to very

See Flower market, Page 2

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## What People Are Saying...

*Although produce may only spend a small proportion of its postharvest life in each marketing situation, the effects of elevated ethylene levels are cumulative.*

*The end result successive levels of moderate ethylene levels throughout marketing can be a very short life in the hands of the consumer. The industry should be seeking to minimize the impact of ethylene on produce at all stages of the marketing chain. The extended market life that would arise from a reduction in ethylene levels during marketing can lead to consumers having greater confidence in the purchase of fruit and vegetables with a resultant increase in sales.*

*"We began placing Ethylene Control packs in every box of flowers that we shipped out of the warehouse and since instituting this practice, we've cut down most of the claims for deteriorated flowers.*

*"Flowers are a naturally perishable product and it's normal to have some spoilage or damage claims. However, now that they have taken protective measures, we can report far less problems than before — even when they ship 10 bouquets to a bucket."*

*Glen Roy  
The Flower Market  
Calgary Alberta  
Canada*

## Upcoming Events

### *OFA Floral Show*

July 10th - 14th  
<http://www.ofa.org>

### *Produce Marketing Association*

Oct. 17th -19th  
[www.pma.com](http://www.pma.com)  
See us at booth #1534

## Flower Market

remote locations, the truckloads of small lots couldn't be economically shipped separately. After some research on the subject of ethylene gas and its destructive nature if not controlled, Roy said the company initiated the use of Ethylene Control packets.

"We began placing Ethylene Control packs in every box of flowers that we shipped out of the warehouse," he said. "Since instituting this practice, we've cut down most of the claims for deteriorated flowers."

Flowers are a naturally perishable product and it's normal to have some spoilage or damage claims. However, now that they have taken protective measures, Roy reports far less problems than before — even when they ship 10 bouquets to a bucket.

The Flower Market has evolved over the years into a major player in the retail supermarket trade. "We've learned that our strength is being a bouquet maker and it has worked well for us," Roy said. "In the early years we were strictly a wholesaler, but found success in our value added bouquet making operation."

The Flower Market employs about 25 people in its Calgary facility and has seen its market share grow consistently over the last five years.

## ProTree Nurseries get the best of cold storage



ProTree Nurseries got its start in the late 1960s under the name, Contra Costa Nursery. Some 36 years later, the company has built a solid reputation for producing top quality fruit trees and ships to all parts of the United States.

Located in Brentwood, Calif., the nursery operation grows and sells apples, cherries and pears. The nursery specializes in propagating more than 40 varieties of apples and 40 varieties of cherries. They produce two popular varieties of pears, said long-time manager, Richard Chavez.

See Nursery finds niche, Page 3

## Nursery finds niche with apples, cherries, pears

Although the business was originally named Contra Costa Nursery, in the mid-70s the name was changed to ProTree Nurseries. Chavez has been with the company for all but the first two years of operation. Early in his career, Chavez was in charge of tree production and spent much of his time in the field.

“We farmed about 10 acres in the beginning,” Chavez said. “At one point, we were growing trees on 160 acres and were moving more than 2.3 million trees a year.”

Currently, ProTree Nurseries farms about 100 acres and produces approximately 1.4 million trees annually, a volume that Chavez called “more efficient and manageable.”

ProTree ships trees to New York, Michigan, Ohio, Pennsylvania, Virginia, Utah, Colorado, and large volumes to Oregon, Washington and of course, California. They also ship to Mexico.

“In the early days we used to hill our trees outside in a trench and covered them with sand,” Chavez said. “We decided we were going to put the trees in cold storage instead of leaving them out in the weather.”

Chavez said he was at an industry meeting in Oregon and one of the presentations warned nurserymen to beware the effects of ethylene gas on their bareroot trees kept in cold storage facilities.

“It's important to monitor the ethylene gas levels,” he said. “So when we first started, we found that we had ethylene readings of 800 parts per billion. We knew it wasn't good for the trees, so we made the transition to EC3 machines from Ethylene Control in the early 80s.”

Chavez said they monitor three huge cold storage rooms now that have a capacity to hold more than 2 million trees, and ethylene levels are usually around 10 ppb.

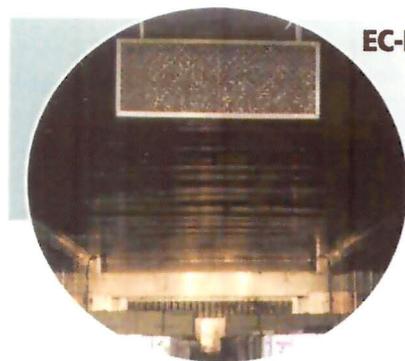
ProTree Nurseries employs 12 people year-round — a workforce that swells to nearly 80 during harvest season.



**EC-Power Pellets Satchet**



**EC-Filters**



**EC-3+ Filtration Systems**



**Super Valu sees big reduction in ethylene levels**

Recently Super Valu's distribution center in Ft. Wayne, Indiana installed EC-3+ ethylene scrubbing equipment. Before the Ethylene Control scrubbers were installed, Super Valu took air samples and Aalto Ethylene Testing analyzed the samples.

Scrubbers were installed in four areas of the facility. A few weeks later, more air samples were taken. These tests show that our products will lower ethylene levels up to 98.9%

"We have indications that we are getting four to five days extension on shelf life in tomato storage alone. The results of banana storage readings are significant. Wet produce has more of a gut feel as inspectors seem to think our California greens are much happier," said Ken Starnes of Super Valu.

<u>Cold Storage rooms</u>	<u>Before EC</u>	<u>With EC</u>	<u>Reduction</u>
1. Dry outside room Potatoes, onions, etc.	470 PPB	98 PPB	80%
2. Wet Room #1 560 PPB lettuce, celery, etc.		15 PPB	97.4%
3. Banana staging area, after gassing	14,560 PPB	171 PPB	98.9%
4. Tomato Storage	5,421 PPB	76 PPB	98.6%

University studies show the industry should be seeking to minimize the impact of ethylene on produce at all stages of the marketing chain. The extended market life that would arise from a reduction in ethylene level during marketing can lead to consumers having greater confidence in the purchase of fruit and vegetables with a resultant increase in sales volume and/or price.

**Which one would you rather eat?**

**Ethylene Control puts you in control**

Fruits and vegetables last much longer when shipped or stored with Ethylene Control products. Help assure that arrivals will be fresh while stretching the shelf life.

**ETHYLENE CONTROL, INC.**  
 (559) 896-1909 • (800) 200-1909 • fax (559) 896-3232  
[www.ethylenecontrol.com](http://www.ethylenecontrol.com)

## Ethylene Gas and Its Effects Upon Flower Bulbs and Cut Flowers

Under certain conditions, the ethylene gas released by the natural ripening process of particular fruits and vegetables can shorten the flower life of particular cut flowers, inhibit the development of immature flower buds, and damage developing flower bulbs.

Leading florist around the world have discovered the benefits of using Ethylene Control sachets and filters in their operations, whether shipping flowers, orchids, bulbs or bare root stock. Or, if you are a consumer who has just received a flower for personal use, the life cycle of flowers are extended well beyond that of flowers not shipped or stored with Ethylene Control.



If you are a florist with a walk-in cold storage box, Ethylene Filters are a must to have. Why not try Ethylene Control sachets with your next inbound shipment of flowers, you will be delighted with the results!!

Ethylene gas is a naturally-occurring plant hormone — but should be given some thought in the following situations:

- when storing flower bulbs in an enclosed space
- when forcing flower bulbs
- when storing or displaying cut flowers

**Which one would you rather eat?**

Without Ethylene Control FreshPak      With Ethylene Control FreshPak

**Ethylene Control puts you in control**

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## The Impact of Ethylene Gas

*Ethylene production and sensitivity levels of selected fresh produce, flowers and nursery stock.\**

	Rate of Ethylene Production	Level of Ethylene Sensitivity	Principal Reaction to Ethylene Gas
<b>Fruits &amp; Vegetables</b>			
Apples	VH	H	Scald, lose crunch
Apricots	H	H	Decay
Asian Pears	H	H	Decay
Asparagus	VL	M	Toughness
Avocados	H	H	Decay
Bananas	M	H	Decay
Berries	VL-L	L	Mold
Broccoli	VL	H	Yellowing
Brussels Sprouts	VL	H	Yellowing
Cantaloupe	H	M	Decay
Carrots	VL	L	Bitterness
Chard	VL	H	Decay
Cherimoya	VH	H	Decay
Cherries	VL	L	Softening
Cucumbers	L	H	Yellowing
Grapefruit	VL	M	Mold
Grapes	VL	L	Mold
Kiwi Fruit	L	H	Decay
Lemons, Limes	VL	M	Mold
Lettuce, Leafy Greens	VL	H	Russet spotting
Mangoes	M	H	Decay
Melons (Crenshaw, Honeydew, Persian)	M	H	Decay
Nectarines	H	H	Decay
Onions, Garlic	VL	L	Odor, sprouting
Oranges	VL	M	Mold, rind breakdown
Papaya	H	H	Decay
Passion Fruit	VH	H	Decay
Peaches	H	H	Decay
Pears (Anjou, Bartlett, Bosc)	H	H	Decay
Persimmons	L	H	Decay
Plums, Prunes	M	H	Decay
Potatoes (Processing, Seed)	VL	M	Sprouting
Quinces	L	H	Decay
Tomatoes	M	H	Shrink, decay
Watermelons	L	H	Lose firmness
<b>Floral &amp; Nursery Commodities</b>			
Cut Flowers (Carnations)	VL	H	Sleepiness, leaf curl
Cut Flowers (Roses)	VL	H	Premature opening
Flower Bulbs	VL	H	Shrink, retards flower formation
Nursery Stock	VL	H	Slower start

VL = Very Low L = Low M = Moderate H = High VH = Very High

\* Source: Fresh Produce Manual for 1997 from the Produce Marketing Association and the 1991 Sea Land Shipping Guide for Perishables

## Independent research supports Ethylene Control's claims

An independent study in 1997 by University of Davis researchers reported that the removal of ethylene gas is "critical to prevent concentrations that exceed the threshold for ethylene injury." In this study, several products claiming to eliminate ethylene gas were tested. Only Ethylene Control products remove ethylene gas levels.

Whether in the laboratory or in real world applications, Ethylene Control products are overachievers. They not only meet their primary function of counteracting ethylene gas, but they also kill air-borne bacteria, viruses, sour rot, blue mold, green mold and brown rot fungi.



## Start buying time... Today!

The impact of ethylene gas varies by commodity, storage and shipping conditions. Every year we learn more about its effects through scientific research and actual use in the field. We can help you evaluate your current environment to improve quality and cut losses from spoilage. To find out more about the impact of ethylene gas on products you handle, please call us today at **1-800-200-1909** or visit our web site at [www.ethylenecontrol.com](http://www.ethylenecontrol.com).

**ETHYLENE**  
CONTROL, INC.

PO Box 571, Selma, CA 93662 • Voice: 559-896-1909 • Fax: 559-896-3232  
Call Toll Free (in North America): 1-800-200-1909 • [www.ethylenecontrol.com](http://www.ethylenecontrol.com)

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**ECI-MATERIAL SAFETY DATA SHEET**

===== SECTION I - TRADE NAME ON LABEL =====

PRODUCT NAME: POWER PELLETS

===== SECTION II - DEPARTMENT OF TRANSPORTATION INFORMATION =====

Proper shipping name: natural zeolite, clinoptilolite  
ID number: not regulated by DOT  
Export information: Harmony #2530.90.0000, check digit 6  
Classification: mineral substances not elsewhere specified or included.  
Notice: Power Pellets contain 1 - 2% manganese compounds (CAS Reg. No. N/A) as part of the mixture and is subject to the reporting requirements of Section 313 of Title III Superfund Amendments and Reauthorization Act of 1986 and 40CFR Part 372.

===== SECTION III - MATERIAL IDENTIFICATION AND INFORMATION =====

Material or Component	CAS No.*	%	Hazard Data
Potassium Permanganate KMnO4	7722-64-7	4-6%	Pel**C**** 5 mg Mn per cubic meter of air.
Natural Zeolite (Clinoptilolite)	12173-10-3	94-96%	TLV-TWA*** 5 mg Mn per cubic meter of air. PEL 10 mg per cubic meter of air total dust. 5 mg per cubic meter of air respirable dust. TLV-TWA 10 mg zeolite per cubic meter of air.
TOTAL		100%	

\* Chemical abstract service number  
\*\* OSHA permissible exposure limit, manganese compounds (expressed as Mn).  
\*\*\* American Conference of Governmental Hygienists, 1988/1989, TLV-TWA= the time weighted average concentration for a normal 8 hour workday and a 40 hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.  
\*\*\*\* Ceiling Exposure Limit or maximum exposure concentration not to be exceeded under any circumstances.

===== SECTION IV - SAFE USAGE DATA =====

Protective equipment types - Eyes: goggles or glasses recommended  
Respiratory: treat as low level nuisance dust, use Nioshmsa #TC-21C-132  
Other: rubber or plastic gloves  
Ventilation - General mechanical: yes  
Local exhaust: if dusting excessive  
Precautions - Handling & storage: store in cool dry area in closed containers.  
Other: Do not eat, avoid contact with eyes and skin.

## ECI-MATERIAL SAFETY DATA SHEET

Page 2

### SECTION V - EMERGENCY RESPONSE DATA

Fire - Extinguishing media: Power Pellets media is not flammable.  
Special Procedures: None  
Unusual Hazards: None

Exposure - *First Aid measures:* Dust inhalation; move to fresh air. Ingestion; seek medical attention.  
Skin contact; wash area. Eye contact; flush with large quantities of water, seek medical attention.

Spills - *Steps to be taken:* Sweep up granules, flush floors with water in sewer, if permitted by federal, state and local regulations.

### SECTION VI - PHYSICAL HAZARD DATA

Flammability - LFL: N/A Flash Point: N/A  
UFL: N/A Methods used:

Stability - Stable: X Conditions to avoid : None  
Unstable: Hazardous Decomp Pots: Dilute KMnO4 solution when wetted.

Hazardous Polymeriation - May occur: Will not occur: X Conditions to avoid : None

Incompatibility - *Materials to avoid:* Protect from water and exposure to contaminated air otherwise media may be rendered useless. Strong acids, oxidizable matter or reducing matter.  
*Hazardous Decomposition or byproducts:* In contact with hydrochloric acid, toxic chlorine gas will evolve.

### SECTION VII - HEALTH HAZARD DATA

Health Hazard - Acute: May be irritating to open wounds, burns and mucous membranes.  
Chronic: Prolonged inhalation of manganese compounds above the threshold limit value may cause lung irritation and central nervous system disorders.

Carcinogenicity - NTP: Not listed. IARC Monographs: Not listed. OSHA Regulated:  
Not listed.

Emergency and First Aid Procedures -  
Eyes: Immediately wash with large amounts of water for 15 minutes.  
Skin: Immediately wash with soap and water.  
Inhalation: Move person out of contaminated area.  
Ingestion: Give several glasses of water or milk, if available. Seek medical attention.

### SECTION VIII - PHYSICAL & CHEMICAL PROPERTIES

Boiling Point: N/A Vapor Density (Air = 1): N/A Volatile Components: N/A  
Vapor Press: N/A pH: N/A Solubility in H<sub>2</sub>O: Partially soluble  
Evaporation Rate: N/A Appearance: Purple granules Odor: No significant odor

### SECTION IX - SUPPLIER DATA

Firms name and mailing address - Name (Print): David Biswell  
Ethylene Control, Inc. Signature:  
8232 E. Dinuba Ave. Title: President  
Selma, CA 93662 Date: April 18, 1994

24 Hour Emergency Telephone Number: (800)200-1909 or (559)896-1909.

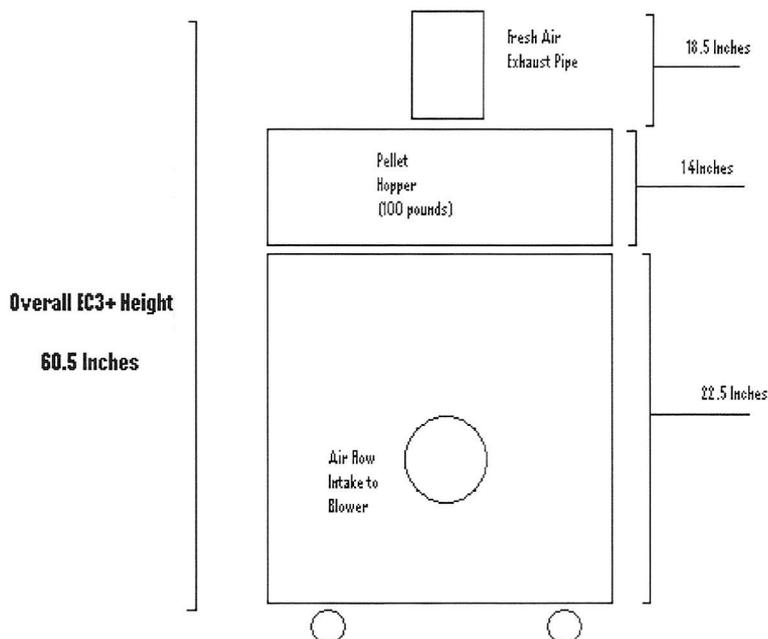
# EC-3+ Technical Data Sheet



## OVERAL DIMENSIONS AND POWER DETAILS

Length	20 Inches	Motor- *	1 HP	110 Volts	1 Phase***	12 Amp
Width	20 Inches	Motor- *	1 HP	220 Volts	1 Phase***	6 Amp
Height	60 ½ Inches	Motor- **	1 HP	220 Volts	3 Phase	3 Amp
Weight	120 pounds	Motor- **	1 HP	380 Volts	3 Phase	1.5 Amp
Air Volume	500 CFM-****	Motor- **	1 HP	440 Volts	3 Phase	1.5 Amp

- \* This is the standard motor configuration. The standard motor is a dual voltage motor and can be wired for 110 volts or 220 volts, single phase.
- \*\* This is the optional motor, for use in certain situations where 3-phase voltage is preferred or required (International). Note that the 3-phase motor has multiple voltage capabilities. Please specify exact requirements prior to order.
- \*\*\* To prevent motor damage or low performance, care must be taken to only use high quality extension cords. If possible, do not use extension power cords!
- \*\*\*\* Note, for proper CFM airflow, 100 pounds of ECI Power Pellets must be installed in the media hopper. Under filling or over filling can affect the efficiency of the EC3+ Air Filtration System, and lower the machines performance.



**EC-3+ FILTRATION SYSTEM**  
**INSTRUCTION SHEET**

- Install casters onto bottom plate with (16) 3 x 20 self tapping screws (provided) using #3 Phillips screw driver.
- Remove lid from hopper and place the 20"x 20" blue washable filter into bottom of hopper before pouring pellets in.
- Pour two 50 lb. pails of Power Pellets into the hopper. Level pellets out evenly and replace lid with attached K & N air filter.  
*Note: Both filters are washable and reusable. Make sure filters are dry before replacing.  
(If pellets get wet, they will stain your hands and clothes.)*
- Attach 4" x 20" round tube to top of hopper lid.
- Check pellets once a month by crushing a few. Pellets turn brown from the outside in. When you have about 20% purple left, it is time to change pellets.
- Stir pellets once a month.
- Dispose of used pellets in proper manner.
- **Motor maintenance - remove pellet hopper to oil motor. See Dayton motor handbook for oiling instructions. Put in a couple drops of a light oil every year.**
- If using an extension cord it must be heavy duty, anything less may trip the breaker.
- Motor must on a 20 amp breaker for the 110 volt, 1 phase system.
- Warranty on unit is 1 year parts.
- If you have any questions, call (800) 200-1909 or (559) 896-1909.
- \_\_\_\_\_ Unit ran and tested by: \_\_\_\_\_

Date: \_\_\_\_\_

## ETHYLENE CONTROL, INC. FILTERS - MOUNTING INSTRUCTIONS

Plastic filter bags can become stained but that does not effect the pellet life

Before installing, remove the plastic over a garbage can and shake out loose pellets

Ethylene Control, Inc. filters can be installed anywhere in the airflow. They should be hung so that air can pass through the filter. **DO NOT** place the filter flat against a wall or directly in front of fans. The Filter can also be placed directly behind the fans.

Each 18"x7"x2" filter comes with mounting bases and plastic ties for hanging the filter. The mounting bases have an adhesive backing that will stick to any clean smooth and dry surface. If the surface is irregular or for walk-ins, the mounting bases can be screwed to the surface through the holes provided (screws not included). That way when you change the filter you just cut the ties and install the new filter without changing the mounting bases. Once mounting bases have been positioned, simply lace the plastic ties through slots in the mounting bases and secure.

### Large Filter

Mounting bases NOT INCLUDED with the 18"x20"x2" filter. Due to the weight (approximately 13lbs.) we recommend this filter be hung from the ceiling with permanently mounted hooks or existing conduit.

### 2lb. Blanket

The Blanket comes with mounting bases and plastic ties for hanging the blanket and is mounted just like the filter.

