Electric Heating For Thermal Insect Control

Presented By

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Thermal Methods of Insect Control

- Recent research conducted by commercial grain processors, the USDA, Kansas State University, and other institutions provides quantitative results from various ways of applying heat for insect control.
- It has been found that raising the ambient temperature to 50°C or higher for a sufficient length of time will kill most of the insects that typically infest stored grain products and grain processing facilities.
- Results vary depending on the insect species, their stage of development, and heat application method.

Why Thermal?

- Montreal Protocol – Methyl Bromide Mandate
- Chemical Residue
- Chemical Resistance
- Chemical Processing Time
- Chemical Costs

Why Electric?

Advantages

- Safe
  - no flames
  - can be left unattended
  - easily controlled
- Clean
  - no by-products of combustion
  - no moisture from by-products of combustion
- Versatile
  - heater can be located directly in the area up to 130°F
  - heater can supply ducted air heated with outlet temperatures up to 172 ºF above inlet temperature
- Portable
  - Heater is compact and on wheels

Why Electric?

Disadvantages

- Large areas may require too much electrical power for many plant installations.

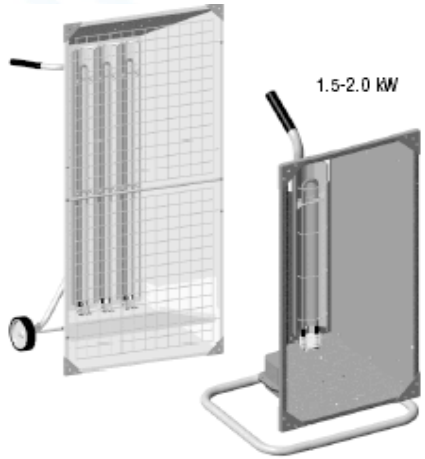
Results of Field Testing

- Field tested and proved effective over a broad spectrum of insects at all stages of development
  - egg
  - larvae
  - pupae
  - adult insects
- It works well on stored product insects
  - Almond moth (*Ephestia cautella*)
  - Cigarette beetle (*Lasioderma serricome*)
  - Foreign grain beetle (*Ahasverus advena*)
  - Indianmeal moth (*Plodia interpunctella)*
  - Kharpra/warehouse beetle *(Trogoderma* species)
  - Red flour beetle (*Tribolium castaneum*)
  - Sawtooth grain beetle (*Oryzaephilus surinamensis*)

Types of Heaters

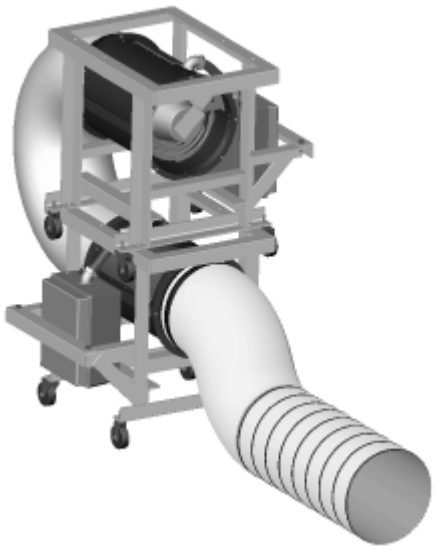
CXH-A
3 TO 35Kw

HDH-A
3 TO 45kW



STAR Portable
2 TO 13.5 kW

- ✓Hazardous Area
- ✓Hose Down Area
- ✓Portable Radiant
- ✓Portable Blower
- ✓Portable High-Pressure Blower



DRA-CC
30 TO 120kW

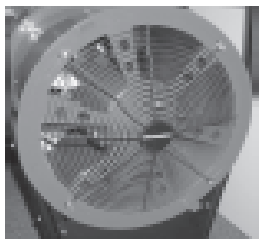
SDRA
30 TO 60 kW

SDRA

Portable High Temperature Blower Heater

- 30, 48 and 60kW
- 102,360 to 240,720 BTUH
- 480 or 600 Volts Three Phase
- Built-in Controls
- Air Temperature to 180˚F
- Use with Flexible Duct

Accessories



AD-16 Adjustable Damper

The adjustable damper can be attached to the intake side of the SuperDragon heaters to reduce the amount of airflow to insure the required air temperature is realized. This is especially important when the unit will be used without flexible duct.

Model	Description	Stock	PCN	Wt (lbs)
AD-16	Adjustable Damper	S	295902	12

Flexible Duct Splice

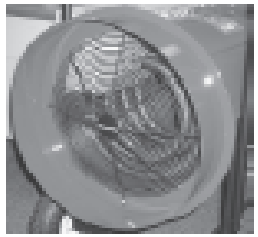
The flexible duct splice is designed to splice two or more 25' lengths of flexible duct to create longer lengths.

Model	Description	Stock	PCN	Wt (lbs)
FDS-20	20" Dia. Duct Splice Kit	S	295881	40

Duct Clamp (not shown)

Stainless steel band is designed to fit over the flexible duct for a secure attachment to the adapter ring or flexible duct splice.

Model	Description	Stock	PCN	Wt (lbs)
DC-20	20" Dia. Duct Clamp	S	295881	3



Duct Adapter Ring

Provides a means to attach 20' flexible duct to the intake or outlet of the SuperDragon series heaters. Two are required if using duct on the inlet and outlet for applications where air is recirculated.

Model	Description	Stock	PCN	Wt (lbs)
DAR-20	20" Duct Adaptor	S	295873	20

FX-20 Flexible Duct

Chromalox heavy duty, flexible duct is constructed of 100% polyester based fabric and is 20" diameter and 25' long. It is made to resist wear and is suitable for temperatures from -40 to 220°F. The duct is internally supported with a steel wire helix and can be used on the air intake end of the heater and will not collapse under the negative pressure.

Model	Description	Stock	PCN	Wt (lbs)
FX-20	20" Dia. Flexible Duct 25'	S	295865	45

Performance Data – Temperature Rise

30 kW "SDRA"									
Duct Length	1500 RPM			1800 RPM			2200 RPM		
	CFM	ΔT	ΔT w/AD-16*	CFM	ΔT	ΔT w/AD-16*	CFM	ΔT	ΔT w/AD-16*
0	1750	53˚F	72-82˚F	2220	42˚F	50-56˚F	2680	35˚F	39-43˚F
25	1610	58˚F	81-88˚F	2100	44˚F	61-69˚F	2250	37˚F	49-54˚F
40	1500	62˚F	Insufficient cfm	1960	48˚F	69-75˚F	2390	39˚F	56-58˚F
50	1410	66˚F		1925	48˚F	74-79˚F	2200	43˚F	Insufficient cfm
65	1325	70˚F		1800	52˚F	80-81˚F	1950	48˚F	
75	1200	78˚F		1650	56˚F	Insufficient cfm	1750	53˚F	
90	1125	82˚F		1410	66˚F		1620	57˚F	
100	1080	86˚F		1300	78˚F		1600	58˚F	
115	Insufficient cfm			1200	72˚F		Insufficient cfm		
125				1150	81˚F				
150				1110	84˚F				
160				1090	86˚F				

Note: Add an additional 15' of duct for each 90˚ bend and 25' of duct for each 180˚ bend. Example: 50' of duct with a 90˚ bend and a 180˚ bend would be be equal to a straight section of duct 90' long.

* Temperature rise with AD-16 Adjustable Damper installed.

Performance Data, continued

48 kW "SDRA"									
Duct Length	1500 RPM			1800 RPM			2200 RPM		
	CFM	ΔT	ΔT w/AD-16*	CFM	ΔT	ΔT w/AD-16*	CFM	ΔT	ΔT w/AD-16*
0	1750	85˚F	115-131˚F	2220	67˚F	80-90˚F	2680	59˚F	62-69˚F
25	1610	93˚F	130-141˚F	2100	71˚F	98-110˚F	2250	59˚F	78-86˚F
40	1500	99˚F	Insufficient cfm	1960	77˚F	110-120˚F	2390	62˚F	90-93˚F
50	1410	106˚F		1925	78˚F	118-126˚F	2200	69˚F	Insufficient cfm
65	1325	112˚F		1800	83˚F	128-130˚F	1950	77˚F	
75	1200	125˚F		1650	91˚F	Insufficient cfm	1750	86˚F	
90	1125	131˚F		1410	106˚F		1620	91˚F	
100	1080	138˚F		1300	115˚F		1600	93˚F	
115	Insufficient cfm			1200	124˚F		Insufficient cfm		
125				1150	130˚F				
150				1110	134˚F				
165				1090	138˚F				

Note: Add an additional 15' of duct for each 90˚ bend and 25' of duct for each 180˚ bend. Example: 50' of duct with a 90˚ bend and a 180˚ bend would be be equal to a straight section of duct 90' long.

* Temperature rise with AD-16 Adjustable Damper installed.

Performance Data, continued

48 kW "SDRA"									
Duct Length	1500 RPM			1800 RPM			2200 RPM		
	CFM	ΔT	ΔT w/AD-16*	CFM	ΔT	ΔT w/AD-16*	CFM	ΔT	ΔT w/AD-16*
0	1750	106˚F	144-164˚F	2220	84˚F	100-112˚F	2680	70˚F	78-86˚F
25	1610	116˚F	Insufficient cfm	2100	88˚F	122-138˚F	2250	74˚F	98-108˚F
40	1500	124˚F		1960	96˚F	138-150˚F	2390	78˚F	112-116˚F
50	1410	132˚F		1925	96˚F	148-158˚F	2200	84˚F	Insufficient cfm
65	1325	140˚F		1800	104˚F	160-162˚F	1950	96˚F	
75	1200	156˚F		1650	112˚F	Insufficient cfm	1750	106˚F	
90	1125	164˚F		1410	132˚F		1620	116˚F	
100	1080	172˚F		1300	144˚F		1600	116˚F	
115	Insufficient cfm			1200	156˚F		Insufficient cfm		
125				1150	162˚F				
150				1110	168˚F				
165				1090	172˚F				

Note: Add an additional 15' of duct for each 90˚ bend and 25' of duct for each 180˚ bend. Example: 50' of duct with a 90˚ bend and a 180˚ bend would be be equal to a straight section of duct 90' long.

* Temperature rise with AD-16 Adjustable Damper installed.

Maximum Outlet 180˚F
Minimum Airflow 1070 CFM