



**Case No.:** \_\_\_\_-\_\_\_\_-EL-EEC

Mercantile Customer: **Emerald Hilton Davis**

Electric Utility: **Duke Energy**

Program Title or  
Description: **Multiple VFD Projects**

Rule 4901:1-39-05(F), Ohio Administrative Code (O.A.C.), permits a mercantile customer to file, either individually or jointly with an electric utility, an application to commit the customer's existing demand reduction, demand response, and energy efficiency programs for integration with the electric utility's programs. The following application form is to be used by mercantile customers, either individually or jointly with their electric utility, to apply for commitment of such programs in accordance with the Commission's pilot program established in Case No. [10-834-EL-POR](#)

Completed applications requesting the cash rebate reasonable arrangement option (Option 1) in lieu of an exemption from the electric utility's energy efficiency and demand reduction (EEDR) rider will be automatically approved on the sixty-first calendar day after filing, unless the Commission, or an attorney examiner, suspends or denies the application prior to that time. Completed applications requesting the exemption from the EEDR rider (Option 2) will also qualify for the 60-day automatic approval so long as the exemption period does not exceed 24 months. Rider exemptions for periods of more than 24 months will be reviewed by the Commission Staff and are only approved up the issuance of a Commission order.

Complete a separate application for each customer program. Projects undertaken by a customer as a single program at a single location or at various locations within the same service territory should be submitted together as a single program filing, when possible. Check all boxes that are applicable to your program. For each box checked, be sure to complete all subparts of the question, and provide all requested additional information. Submittal of incomplete applications may result in a suspension of the automatic approval process or denial of the application.

Any confidential or trade secret information may be submitted to Staff on disc or via email at [ee-pdr@puc.state.oh.us](mailto:ee-pdr@puc.state.oh.us).

## Section 1: Mercantile Customer Information

Name: **Emerald Hilton Davis**

Principal address: **2235 Langdon Farm Rd, Cincinnati, Ohio 45237**

Address of facility for which this energy efficiency program applies:

**2235 Langdon Farm Rd, Cincinnati, Ohio 45237**

Name and telephone number for responses to questions:

**Grady Reid, Jr Duke Energy 513-287-1038**

Electricity use by the customer (check the box(es) that apply):

- The customer uses more than seven hundred thousand kilowatt hours per year at the above facility. (**Refer to Appendix A for documentation.**)
- The customer is part of a national account involving multiple facilities in one or more states. (Please attach documentation.)

## Section 2: Application Information

A) The customer is filing this application (choose which applies):

- Individually, without electric utility participation.
- Jointly with the electric utility.**

B) The electric utility is: **Duke Energy**

C) The customer is offering to commit (check any that apply):

- Energy savings from the customer's energy efficiency program. (Complete Sections 3, 5, 6, and 7.)
- Capacity savings from the customer's demand response/demand reduction program. (Complete Sections 4, 5, 6, and 7.)
- Both the energy savings and the capacity savings from the customer's energy efficiency program. (Complete all sections of the Application.)

### Section 3: Energy Efficiency Programs

A) The customer's energy efficiency program involves (check those that apply):

- ✓ Early replacement of fully functioning equipment with new equipment. (Provide the date on which the customer replaced fully functioning equipment, and the date on which the customer would have replaced such equipment if it had not been replaced early. Please include a brief explanation for how the customer determined this future replacement date (or, if not known, please explain why this is not known)).

**The following new equipment was installed starting March 2008 and was finished September 2011.**

**1 VFD on 150 HP Kady Mill  
1 VFD on 20 HP Mill - 5832 hours  
2 VFD's on 20 HP Mills - 4860 hours  
2 VFD's on 40 HP Mixers  
2 VFD's on 50 HP Mixers - 4860 hours  
1 VFD on 50 HP Mixer - 1944 hours  
3 VFD's on 50 HP Mixers - 6156 hours  
1 VFD on 50 HP Scraper**

- Installation of new equipment to replace equipment that needed to be replaced The customer installed new equipment on the following date(s):
- Installation of new equipment for new construction or facility expansion. The customer installed new equipment on the following date(s):
- Behavioral or operational improvement.

B) Energy savings achieved/to be achieved by the energy efficiency program:

- 1) If you checked the box indicating that the project involves the early replacement of fully functioning equipment replaced with new equipment, then calculate the annual savings [(kWh used by the original equipment) - (kWh used by new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

**Annual savings: 690,318 kWh (Refer to Appendix B for calculations and supporting documents).**

- 2) If you checked the box indicating that the customer installed new equipment to replace equipment that needed to be replaced, then calculate the annual savings [(kWh used by less efficient new equipment) - (kWh

used by the higher efficiency new equipment) = (kWh per year saved)].  
Please attach your calculations and record the results below:

Annual savings:

Please describe any less efficient new equipment that was rejected in favor of the more efficient new equipment.

- 3) If you checked the box indicating that the project involves equipment for new construction or facility expansion, then calculate the annual savings [(kWh used by less efficient new equipment) - (kWh used by higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: \_\_\_\_\_kWh

Please describe the less efficient new equipment that was rejected in favor of the more efficient new equipment.

- 4) If you checked the box indicating that the project involves behavioral or operational improvements, provide a description of how the annual savings were determined.
-

## Section 4: Demand Reduction/Demand Response Programs

A) The customer's program involves (check the one that applies):

- Coincident peak-demand savings from the customer's energy efficiency program.**
- Actual peak-demand reduction. (Attach a description and documentation of the peak-demand reduction.)
- Potential peak-demand reduction (check the one that applies):
  - The customer's peak-demand reduction program meets the requirements to be counted as a capacity resource under a tariff of a regional transmission organization (RTO) approved by the Federal Energy Regulatory Commission.
  - The customer's peak-demand reduction program meets the requirements to be counted as a capacity resource under a program that is equivalent to an RTO program, which has been approved by the Public Utilities Commission of Ohio.

B) On what date did the customer initiate its demand reduction program?

**New equipment was installed starting March 2008 and was finished September 2011.**

C) What is the peak demand reduction achieved or capable of being achieved (show calculations through which this was determined):

**17.9 kW**

**Refer to Appendix B for calculations and supporting documents.**

## Section 5: Request for Cash Rebate Reasonable Arrangement (Option 1) or Exemption from Rider (Option 2)

Under this section, check the box that applies and fill in all blanks relating to that choice.

Note: If Option 2 is selected, the application will not qualify for the 60-day automatic approval. All applications, however, will be considered on a timely basis by the Commission.

A) The customer is applying for:

**Option 1: A cash rebate reasonable arrangement.**

OR

Option 2: An exemption from the energy efficiency cost recovery mechanism implemented by the electric utility.

OR

Commitment payment

B) The value of the option that the customer is seeking is:

Option 1: A cash rebate reasonable arrangement, which is the lesser of (show both amounts):

A cash rebate of **\$15,250. Refer to Appendix C for documentation.** (Rebate shall not exceed 50% project cost. Attach documentation showing the methodology used to determine the cash rebate value and calculations showing how this payment amount was determined.) **NOTE: Due to its own error, Duke will honor the offer letter sent at the company's expense.**

Option 2: An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider.

An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for \_\_\_ months (not to exceed 24 months). (Attach calculations showing how this time period was determined.)

OR

A commitment payment valued at no more than

\$\_\_\_\_\_. (Attach documentation and calculations showing how this payment amount was determined.)

OR

- Ongoing exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for an initial period of 24 months because this program is part of the customer's ongoing efficiency program. (Attach documentation that establishes the ongoing nature of the program.) In order to continue the exemption beyond the initial 24 month period, the customer will need to provide a future application establishing additional energy savings and the continuance of the organization's energy efficiency program.)

### Section 6: Cost Effectiveness

The program is cost effective because it has a benefit/cost ratio greater than 1 using the (choose which applies):

- Total Resource Cost (TRC) Test. The calculated TRC value is: \_\_\_\_\_ (Continue to Subsection 1, then skip Subsection 2)
- Utility Cost Test (UCT) . The calculated UCT value is **13.41** (Skip to Subsection 2.) **Refer to Appendix D for calculations and supporting documents.**

#### Subsection 1: TRC Test Used (please fill in all blanks).

The TRC value of the program is calculated by dividing the value of our avoided supply costs (generation capacity, energy, and any transmission or distribution) by the sum of our program overhead and installation costs and any incremental measure costs paid by either the customer or the electric utility.

The electric utility's avoided supply costs were \_\_\_\_\_.

Our program costs were \_\_\_\_\_.

The incremental measure costs were \_\_\_\_\_.

| Subsection 2: UCT Used (please fill in all blanks).

We calculated the UCT value of our program by dividing the value of our avoided supply costs (capacity and energy) by the costs to our electric utility (including administrative costs and incentives paid or rider exemption costs) to obtain our commitment.

Our avoided supply costs were **\$362,200**.

The utility's program costs were **\$11,760**.

The utility's incentive costs/rebate costs were **\$15,250**.

**Refer to Appendix D for calculations and supporting documents.**

### **Section 7: Additional Information**

Please attach the following supporting documentation to this application:

Narrative description of the program including, but not limited to, make, model, and year of any installed and replaced equipment.

A copy of the formal declaration or agreement that commits the program or measure to the electric utility, including:

- 1) any confidentiality requirements associated with the agreement;
- 2) a description of any consequences of noncompliance with the terms of the commitment;
- 3) a description of coordination requirements between the customer and the electric utility with regard to peak demand reduction;
- 4) permission by the customer to the electric utility and Commission staff and consultants to measure and verify energy savings and/or peak-demand reductions resulting from your program; and,
- 5) a commitment by the customer to provide an annual report on your energy savings and electric utility peak-demand reductions achieved.

#### **Refer to Appendix E for supporting documentation**

A description of all methodologies, protocols, and practices used or proposed to be used in measuring and verifying program results. Additionally, identify and explain all deviations from any program measurement and verification guidelines that may be published by the Commission.



Please indicate your response to this rebate offer within 30 days of receipt.

Rebate is accepted.

Rebate is declined.

By accepting this rebate, Emerald Hilton Davis LLC affirms its intention to commit and integrate the energy efficiency projects listed on the following pages into Duke Energy's peak demand reduction, demand response and/or energy efficiency programs.

Additionally, Emerald Hilton Davis LLC also agrees to serve as joint applicant in any future filings necessary to secure approval of this arrangement as required by PUCO and to comply with any information and reporting requirements imposed by rule or as part of that approval.

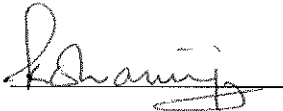
Finally, Emerald Hilton Davis LLC affirms that all application information submitted to Duke Energy pursuant to this rebate offer is true and accurate. Information in question would include, but not be limited to, project scope, equipment specifications, equipment operational details, project costs, project completion dates, and the quantity of energy conservation measures installed.

If rebate is accepted, will you use the monies to fund future energy efficiency and/or demand reduction projects?

YES

NO

If rebate is declined, please indicate reason (optional):



Customer Signature

PREMK DHAMIJA

Printed Name

12-06-11

Date

### Proposed Rebate Amounts

Measure ID	Energy Conservation Measure (ECM)	Proposed Rebate Amount
ECM-1	1 - 150 hp Kady Mill	\$5000.00
ECM-2	1 - VFD, 20 hp mill	\$575.00
ECM-3	2 - VFD, 20 hp mills	\$800.00
ECM-4	3 - VFD, 40 hp mixers	\$3750.00
ECM-5	2 - VFD, 50 hp mixer	\$1700.00
ECM-6	1 - VFD, 50 hp mixers	\$1225.00
ECM-7	2 - VFD, 50 hp mixers	\$1300.00
ECM-8	1 - VFD, 50 hp scraper	\$1500.00
Total		\$15,850.00



**Public Utilities  
Commission**

**Application to Commit  
Energy Efficiency/Peak  
Demand Reduction  
Programs  
(Mercantile Customers  
Only)**

Case No.: \_\_\_\_ - \_\_\_\_ -EL-EEC

State of \_\_\_\_\_ :

Prem Dhamija, Affiant, being duly sworn according to law, deposes and says that:

1. I am the duly authorized representative of:

EMERALD HILTON DAVIS, LLC  
[insert customer or EDU company name and any applicable name(s) doing business as]

2. I have personally examined all the information contained in the foregoing application, including any exhibits and attachments. Based upon my examination and inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete.

3. I am aware of fines and penalties which may be imposed under Ohio Revised Code Sections 2921.11, 2921.31, 4903.02, 4903.03, and 4903.99 for submitting false information.

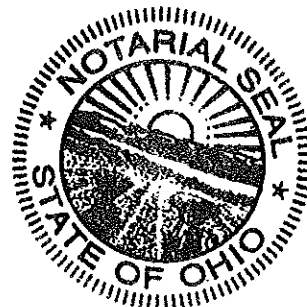
Prem Dhamija Sr. ELECT. ENGR.  
Signature of Affiant & Title

Sworn and subscribed before me this 7 day of December,  
2011 Month/Year

Kelly A Stansbury  
Signature of official administering oath

Kelly A. Stansbury  
Print Name and Title

My commission expires on 04-18-2012



Appendix A - Emerald Hilton Davis

96000753 02		
EMERALD HILTON DAVIS		
2235 LANGDON FARM RD		
CINCINNATI, OH 45237		
Date	Days	Actual KWH
8/29/2011	31	1,876,190
7/29/2011	30	1,717,061
6/29/2011	29	1,740,677
5/31/2011	32	1,766,938
4/29/2011	30	1,755,816
3/30/2011	29	1,829,827
3/1/2011	29	1,828,502
1/31/2011	32	1,972,752
12/30/2010	31	1,868,242
11/29/2010	33	1,799,357
10/27/2010	29	1,698,413
9/28/2010	32	1,939,291
<b>Total</b>		<b>21,793,066</b>

**See Appendix B At The End**

**Appendix C -Cash Rebate Calculation**

**VFD**

<b>Measure</b>	<b>Quantity</b>	<b>Cash Rebate Rate</b>	<b>Rebate</b>	<b>Cash Rebate</b>
Emerald Hilton Davis - VFD, 150 hp Kady Mill	1	50% of incentive that would be offered by the Smart \$aver Custom program	\$5,000	<b>\$5,000</b>
Emerald Hilton Davis - VFD, 20 hp mill 5832 hours	1	50% of incentive that would be offered by the Smart \$aver Custom program	\$575	<b>\$575</b>
Emerald Hilton Davis - VFD, 20 hp mills 4860 hours	2	50% of incentive that would be offered by the Smart \$aver Custom program	\$400	<b>\$800</b>
Emerald Hilton Davis - VFD, 40 hp mixers 6156 hours	2	50% of incentive that would be offered by the Smart \$aver Custom program	\$1,250	<b>\$2,500</b>
Emerald Hilton Davis - VFD, 50 hp mixers 4860 hours	2	50% of incentive that would be offered by the Smart \$aver Custom program	\$850	<b>\$1,700</b>
Emerald Hilton Davis - VFD, 50 hp mixer 1944 hours	1	50% of incentive that would be offered by the Smart \$aver Custom program	\$1,225	<b>\$1,225</b>
Emerald Hilton Davis - VFD, 50 hp mixers	3	50% of incentive that would be offered by the Smart \$aver Custom program	\$650	<b>\$1,950</b>
Emerald Hilton Davis - VFD, 50 hp scraper	1	50% of incentive that would be offered by the Smart \$aver Custom program	\$1,500	<b>\$1,500</b>
			<b>Total</b>	<b>\$15,250</b>

**Appendix D -UCT Value**

**VFD**

<b>Measure</b>	<b>Total Avoided Cost</b>	<b>Program Cost</b>	<b>Incentive</b>	<b>Quantity</b>	<b>Measure UCT</b>
Emerald Hilton Davis - VFD, 150 hp Kady Mill	\$70,112	\$3,065	\$5,000	1	<b>8.69</b>
Emerald Hilton Davis - VFD, 20 hp mill 5832 hours	\$15,508	\$474	\$575	1	<b>14.78</b>
Emerald Hilton Davis - VFD, 20 hp mills 4860 hours	\$13,165	\$361	\$400	2	<b>17.30</b>
Emerald Hilton Davis - VFD, 40 hp mixers	\$17,528	\$766	\$1,250	2	<b>8.69</b>
Emerald Hilton Davis - VFD, 50 hp mixers 4860 hours	\$31,191	\$970	\$850	2	<b>17.14</b>
Emerald Hilton Davis - VFD, 50 hp mixer 1944 hours	\$14,657	\$540	\$1,225	1	<b>8.30</b>
Emerald Hilton Davis - VFD, 50 hp mixers 6156 hours	\$38,540	\$849	\$650	3	<b>25.71</b>
Emerald Hilton Davis - VFD, 50 hp scraper	\$22,536	\$940	\$1,500	1	<b>9.24</b>
<b>Totals</b>	<b>\$362,200</b>	<b>\$11,760</b>	<b>\$15,250</b>	<b>13</b>	

Total Avoided Supply Costs      \$362,200  
 Total Program Costs                \$11,760  
 Total Incentive                        \$15,250

**Aggregate Application UCT                        13.41**

Appendix B – Energy Savings Achieved

ECM	Pre-Project (at the meter)			Post-Project (at the meter)			Savings (at the meter)	
	As-Found Equipment	Total Annual kWh <sup>1</sup>	Summer Coincident kW <sup>1</sup>	New Equipment	Total Annual kWh <sup>1</sup>	Summer Coincident kW <sup>2</sup>	Energy Savings (kWh)	Demand Savings (kW) <sup>2</sup>
ECM1	150 HP Kady Mill Motor	527,697	109.9	VFD Added	409,234	112.2	118,463	(2.2)
ECM2	50 HP Scraper Motor	169,617	35.3	VFD Added	131,540	36.1	38,077	(0.7)
ECM3	40 HP Meyer Mixer Motor	131,924	27.5	VFD Added	103,309	28.0	29,616	(0.6)
ECM4	50 HP Ross Mixer Motor – 6,156 Operating Hours	217,534	35.3	VFD Added	146,502	32.5	71,031	2.9
ECM5	50 HP Ross Mixer Motor – 4,860 Operating Hours	171,737	35.3	VFD Added	115,660	32.5	56,077	2.9
ECM6	50 HP Ross Mixer Motor – 1,944 Operating Hours	68,695	35.3	VFD Added	46,264	32.5	22,431	2.9
ECM7	20 HP Netzsch Mill Motor – 4,860 Operating Hours	68,695	14.1	VFD Added	44,862	13.0	23,833	1.2
ECM8	20 HP Netzsch Mill Motor – 5,832 Operating Hours	82,434	14.1	VFD Added	53,834	13.0	28,599	1.2

Notes:

1. Energy consumption baseline, demand baseline and post-project energy consumption basis are outlined in the following pages.
2. Demand savings are returned by DSMore software as a result of energy savings allocations at the coincident hour. Post-project demand is calculated as the difference between pre-project modeled demand and the DSMore software result. An exception occurs where it was identified that the addition of the VFD introduces the possibility of a demand increase at the coincident hour. In these cases, the expected demand increase is applied.



ECM	Quantity	Total Annual Energy Savings (kWh)	Total Demand Savings (kW)
ECM1	1	118,463	(2.2)
ECM2	1	38,077	(0.7)
ECM3	2	59,231	(1.1)
ECM4	3	213,094	8.7
ECM5	2	112,155	5.8
ECM6	1	22,431	2.9
ECM7	2	47,666	2.3
ECM8	1	28,599	1.2
Total		639,716	16.7

Application of 7.43% line losses yields **690,318 kWh** savings and **17.9 coincident kW** savings at the plant. This value also reflects minor rounding error resulting from the analytical mode of DSMore software used to model the projects.



The VFD Worksheet is part 2 of the application. Do not submit this file without submitting a completed Part1 Custom Application document file, which can be found at [www.duke-energy.com](http://www.duke-energy.com).

Before you complete this application, please note the following important criteria:

- Submitting this application does not guarantee an incentive will be approved.
- Rebates are based on electricity conservation only.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Incomplete applications will not be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, found in the Mercantile Self Custom Application Part 1 document.

Please enter your information and data into the cells that are shaded.  
Cells in white are locked and cannot be written over.

**Duke Energy Customer Contact Information (Match the information in Application Part 1):**

Name	Prem Dhamija
Company	Emerald Hilton Davis

**Equipment Vendor / Project Engineer Contact Information**

Name	Sid Rose
Company	Cincinnati Belting & Transmission

**Location of Proposed VFD Project**

Site Name	Cincinnati site
Electric Account Number(s)	9600-0753-02
Site Address	2235 Langdon Farm Rd., Cincinnati, OH 45237

Before proceeding with the custom application, please verify that your project is not on the Self-Direct Prescriptive application.

The prescriptive incentive applications can be found at:

<http://www.duke-energy.com/ohio-large-business/smart-saver/mercantile-self-direct.asp>

Prescriptive rebate amounts are pre-approved.



Use one worksheet for each type of motor or fan that is being evaluated for a VFD

<b>Driven Equipment</b>	<b>Name</b>	Kady Mill	<b>Type</b>	Process
<b>Quantity</b>		1		
<b>Brake HP (BHP) at Full Load</b> (see note 1)		140.0		
<b>Nameplate HP</b>		150.0		

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<b>Rev.</b>	

**Current Equipment Operation without VFD - Input values for ONE driven equipment and its motor.**

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Nameplate HP	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
100	140.0	93%	95 %	109.94	4,800														
%	0.0	0%	%	#DIV/0!															0
%	0.0	0%	%	#DIV/0!															0
%	0.0	0%	%	#DIV/0!															0
Not Running	0.0	0%	NA	0.00	3,960	744	672	744	720	744	720	744	744	720	744	720	744	744	8,760
<b>Totals</b>					<b>8,760</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>

**Proposed Equipment Operation with VFD - Input values for ONE driven equipment and its motor.**

<b>Efficiency of VFD</b>	98 %
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% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Motor Nameplate	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
100	140.0	93%	95 %	109.94	960														0
90	126.0	84%	95 %	98.94															0
80	112.0	75%	95 %	87.95	1920														0
70	98.0	65%	95 %	76.96															0
60	84.0	56%	95 %	65.96	1920														0
50	70.0	47%	95 %	54.97															0
40	56.0	37%	95 %	43.97															0
30	42.0	28%	95 %	32.98															0
20	28.0	19%	95 %	21.99															0
10	14.0	9%	95 %	10.99															0
Not Running	0.0	0%	NA	0.00	3,960	744	672	744	720	744	720	744	744	720	744	720	744	744	8,760
<b>Totals</b>					<b>3,960</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>

**Detailed Project Description Attached?**  (Required)

**1 Brake HP (BHP) at Full Load**

The "full load" operating condition is the condition at which the driven equipment operates for the base condition (i.e., without the VFD)

**2 Annual hours that motor runs**

If the % operating loads do not vary between months, then enter the total annual hours that the motor will run at full load, partial load and hours not operating.

**3 Monthly hours that each motor runs**

If the % operating loads vary between months (due to weather conditions or seasonal load), fill in the expected hours that the motor will run each month at full load, partial load and hours not operating.



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**Operating Hours** (see note 4)

24 x 7	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
	7:00 AM	11:00 PM	7:00 AM	11:00 PM			52	4,800

**Energy Savings**

	Existing (no VFD)	Proposed (VFD)	Savings	Describe how energy numbers were calculated
Annual Electric Energy	527,697 kWh	409,234 kWh	118,463 kWh	see calcs for cells AM15, AN15, AM16, & AN16 (NOTE: values in these cells are per VFD)
Electric Demand (kilowatts)	110 kW	112 kW	-2 kW	
Calculations attached	No	No		

**Simple Payback**

Average electric rate (\$/kWh) on the applicable accounts (see note 6)	\$0.08
Estimated annual electric savings	\$9,122
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels	
Incremental cost to implement the project (equipment & installation) (see note 7)	\$23,650.10
Copy of vendor proposal is attached (see note 8)	Yes
Simple Electric Payback in years (see note 9)	2.592753062
Total Payback in years	2.592753062

**4 Operating Hours**

Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

**5 Weeks of Use in Year**

If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why:

Not running during holidays and some weekends, depending on production demand.

**6 Average electric rate (\$/kWh)**

If you do not know your average electric rate, use \$0.10/kWh.

**7 Incremental cost to implement the project**

Costs exclude self installation costs.

Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

**8 Copy of vendor invoice is attached**

Vendor invoices detailing costs of the project are always required.

New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

**9 Simple Electric Payback**

If the simple payback on the project is less than 1 year, the rebate structure is affected.

Please check that the electric rate is accurate based on history.



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Please enter your information and data into the cells that are shaded.  
Cells in white are locked and cannot be written over.

**Duke Energy Customer Contact Information (Match the information in Application Part 1):**

Name	Prem Dhamija
Company	Emerald Hilton Davis

**Equipment Vendor / Project Engineer Contact Information**

Name	Sid Rose
Company	Cincinnati Belting & Transmission

**Location of Proposed VFD Project**

Site Name	Cincinnati site
Electric Account Number(s)	9600-0753-02
Site Address	2235 Langdon Farm Rd., Cincinnati, OH 45237

Before proceeding with the custom application, please verify that your project is not on the Self-Direct Prescriptive application.

The prescriptive incentive applications can be found at:

<http://www.duke-energy.com/ohio-large-business/smart-saver/mercantile-self-direct.asp>

Prescriptive rebate amounts are pre-approved.



Use one worksheet for each type of motor or fan that is being evaluated for a VFD

<b>Driven Equipment</b>	<b>Name</b>	Scrapper	<b>Type</b>	Process	<b>App No.</b>	
<b>Quantity</b>		1			<b>Rev.</b>	
<b>Brake HP (BHP) at Full Load</b> (see note 1)		45.0				
<b>Nameplate HP</b>		50.0				

**Current Equipment Operation without VFD - Input values for ONE driven equipment and its motor.**

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Nameplate HP	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)							
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec								
						100	%	45.0	90%	95	%	35.34	4,800												
	%	0.0	0%		%	#DIV/0!																			0
	%	0.0	0%		%	#DIV/0!																			0
	%	0.0	0%		%	#DIV/0!																			0
Not Running		0.0	0%	NA	%	0.00	3,960	744	672	744	720	744	720	744	744	720	744	744	720	744	720	744	744	8,760	
<b>Totals</b>						<b>8,760</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>		

**Proposed Equipment Operation with VFD - Input values for ONE driven equipment and its motor.**

**Efficiency of VFD**  %

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Motor Nameplate	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)							
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec								
						100	%	45.0	90%	95	%	35.34	960												
90	%	40.5	81%	95	%	31.80																			0
80	%	36.0	72%	95	%	28.27	1920																		0
70	%	31.5	63%	95	%	24.74																			0
60	%	27.0	54%	95	%	21.20	1920																		0
50	%	22.5	45%	95	%	17.67																			0
40	%	18.0	36%	95	%	14.13																			0
30	%	13.5	27%	95	%	10.60																			0
20	%	9.0	18%	95	%	7.07																			0
10	%	4.5	9%	95	%	3.53																			0
Not Running		0.0	0%	NA	%	0.00	3,960	744	672	744	720	744	720	744	744	720	744	744	720	744	720	744	744	8,760	
<b>Totals</b>						<b>3,960</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>		

**Detailed Project Description Attached?**  (Required)

**1 Brake HP (BHP) at Full Load**

The "full load" operating condition is the condition at which the driven equipment operates for the base condition (i.e., without the VFD)

**2 Annual hours that motor runs**

If the % operating loads do not vary between months, then enter the total annual hours that the motor will run at full load, partial load and hours not operating.

**3 Monthly hours that each motor runs**

If the % operating loads vary between months (due to weather conditions or seasonal load), fill in the expected hours that the motor will run each month at full load, partial load and hours not operating.



App No.	0
Rev.	0

**Operating Hours** (see note 4)

24 x 7	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
	7:00 AM	11:00 PM	7:00 AM	11:00 PM			52	4,800

**Energy Savings**

	Existing (no VFD)	Proposed (VFD)	Savings	Describe how energy numbers were calculated
Annual Electric Energy	169,617 kWh	131,540 kWh	38,077 kWh	see calcs for cells AM15, AN15, AM16, & AN16 (NOTE: values in these cells are per VFD)
Electric Demand (kilowatts)	35 kW	36 kW	-1 kW	
Calculations attached	No	No		

**Simple Payback**

Average electric rate (\$/kWh) on the applicable accounts (see note 6)	\$0.08
Estimated annual electric savings	\$2,932
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels	
Incremental cost to implement the project (equipment & installation) (see note 7)	\$11,764.70
Copy of vendor proposal is attached (see note 8)	Yes
Simple Electric Payback in years (see note 9)	4.012587847
<b>Total Payback in years</b>	<b>4.012587847</b>

**4 Operating Hours**

Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

**5 Weeks of Use in Year**

If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why:

Not running during holidays and some weekends, depending on production demand.

**6 Average electric rate (\$/kWh)**

If you do not know your average electric rate, use \$0.10/kWh.

**7 Incremental cost to implement the project**

Costs exclude self installation costs.

Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

**8 Copy of vendor invoice is attached**

Vendor invoices detailing costs of the project are always required.

New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

**9 Simple Electric Payback**

If the simple payback on the project is less than 1 year, the rebate structure is affected.

Please check that the electric rate is accurate based on history.



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**Duke Energy Customer Contact Information (Match the information in Application Part 1):**

Name	Prem Dhamija
Company	Emerald Hilton Davis

**Equipment Vendor / Project Engineer Contact Information**

Name	Sid Rose
Company	Cincinnati Belting & Transmission

**Location of Proposed VFD Project**

Site Name	Cincinnati site
Electric Account Number(s)	9600-0753-02
Site Address	2235 Langdon Farm Rd., Cincinnati, OH 45237

Before proceeding with the custom application, please verify that your project is not on the Self-Direct Prescriptive application.

The prescriptive incentive applications can be found at:

<http://www.duke-energy.com/ohio-large-business/smart-saver/mercantile-self-direct.asp>

Prescriptive rebate amounts are pre-approved.





Use one worksheet for each type of motor or fan that is being evaluated for a VFD

<b>Driven Equipment</b>	<b>Name</b>	Meyer Mixers	<b>Type</b>	Process
<b>Quantity</b>		2		
<b>Brake HP (BHP) at Full Load</b> (see note 1)		35.0		
<b>Nameplate HP</b>		40.0		

<b>App No.</b>	
<b>Rev.</b>	

**Current Equipment Operation without VFD - Input values for ONE driven equipment and its motor.**

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Nameplate HP	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)		
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
100	35.0	88%	95 %	27.48	4,800															0
%	0.0	0%	%	#DIV/0!																0
%	0.0	0%	%	#DIV/0!																0
%	0.0	0%	%	#DIV/0!																0
Not Running	0.0	0%	NA	0.00	3,960	744	672	744	720	744	720	744	744	720	744	720	744	720	744	8,760
<b>Totals</b>						<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>8,760</b>

**Proposed Equipment Operation with VFD - Input values for ONE driven equipment and its motor.**

<b>Efficiency of VFD</b>	98 %
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% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Motor Nameplate	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)			
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
100	35.0	88%	95 %	27.48	960															0	
90	31.5	79%	95 %	24.74																0	
80	28.0	70%	95 %	21.99	1920															0	
70	24.5	61%	95 %	19.24																0	
60	21.0	53%	95 %	16.49	1920															0	
50	17.5	44%	95 %	13.74																0	
40	14.0	35%	95 %	10.99																0	
30	10.5	26%	95 %	8.25																0	
20	7.0	18%	95 %	5.50																0	
10	3.5	9%	95 %	2.75																0	
Not Running	0.0	0%	NA	0.00	3,960	744	672	744	720	744	720	744	744	720	744	720	744	720	744	8,760	
<b>Totals</b>						<b>3,960</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>8,760</b>

Detailed Project Description Attached?  (Required)

**1 Brake HP (BHP) at Full Load**

The "full load" operating condition is the condition at which the driven equipment operates for the base condition (i.e., without the VFD)

**2 Annual hours that motor runs**

If the % operating loads do not vary between months, then enter the total annual hours that the motor will run at full load, partial load and hours not operating.

**3 Monthly hours that each motor runs**

If the % operating loads vary between months (due to weather conditions or seasonal load), fill in the expected hours that the motor will run each month at full load, partial load and hours not operating.



App No.	0
Rev.	0

**Operating Hours** (see note 4)

24 x 7	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
	7:00 AM	11:00 PM	7:00 AM	11:00 PM			52	4,800

**Energy Savings**

	Existing (no VFD)	Proposed (VFD)	Savings	Describe how energy numbers were calculated
Annual Electric Energy	131,924 kWh	102,309 kWh	29,616 kWh	see calcs for cells AM15, AN15, AM16, & AN16 (NOTE: values in these cells are per VFD)
Electric Demand (kilowatts)	27 kW	28 kW	-1 kW	
Calculations attached	No	No		

**Simple Payback**

Average electric rate (\$/kWh) on the applicable accounts (see note 6)	\$0.08
Estimated annual electric savings	\$2,280
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels	
Incremental cost to implement the project (equipment & installation) (see note 7)	\$20,009.57
Copy of vendor proposal is attached (see note 8)	Yes
Simple Electric Payback in years (see note 9)	8.77457159
<b>Total Payback in years</b>	<b>8.77457159</b>

**4 Operating Hours**

Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

**5 Weeks of Use in Year**

If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why:

Not running during holidays and some weekends, depending on production demand.

**6 Average electric rate (\$/kWh)**

If you do not know your average electric rate, use \$0.10/kWh.

**7 Incremental cost to implement the project**

Costs exclude self installation costs.

Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

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**Duke Energy Customer Contact Information (Match the information in Application Part 1):**

Name	Prem Dhamija
Company	Emerald Hilton Davis

**Equipment Vendor / Project Engineer Contact Information**

Name	Sid Rose
Company	Cincinnati Belting & Transmission

**Location of Proposed VFD Project**

Site Name	Cincinnati site
Electric Account Number(s)	9600-0753-02
Site Address	2235 Langdon Farm Rd., Cincinnati, OH 45237

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Prescriptive rebate amounts are pre-approved.



Use one worksheet for each type of motor or fan that is being evaluated for a VFD

<b>Driven Equipment</b>	<b>Name</b>	Ross Mixers	<b>Type</b>	Process
<b>Quantity</b>		3		
<b>Brake HP (BHP) at Full Load</b> (see note 1)		45.0		
<b>Nameplate HP</b>		50.0		

<b>App No.</b>	
<b>Rev.</b>	

**Current Equipment Operation without VFD - Input values for ONE driven equipment and its motor.**

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Nameplate HP	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)		
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
100	45.0	90%	95 %	35.34	6,156															0
%	0.0	0%	%	#DIV/0!																0
%	0.0	0%	%	#DIV/0!																0
%	0.0	0%	%	#DIV/0!																0
Not Running	0.0	0%	NA	0.00	2,604	744	672	744	720	744	720	744	744	720	744	720	744	720	744	8,760
					<b>Totals</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>8,760</b>

**Proposed Equipment Operation with VFD - Input values for ONE driven equipment and its motor.**

<b>Efficiency of VFD</b>	98 %
--------------------------	------

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Motor Nameplate	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)		
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
100	45.0	90%	95 %	35.34																0
90	40.5	81%	95 %	31.80	1231															0
80	36.0	72%	95 %	28.27																0
70	31.5	63%	95 %	24.74	2462															0
60	27.0	54%	95 %	21.20																0
50	22.5	45%	95 %	17.67	2462															0
40	18.0	36%	95 %	14.13																0
30	13.5	27%	95 %	10.60																0
20	9.0	18%	95 %	7.07																0
10	4.5	9%	95 %	3.53																0
Not Running	0.0	0%	NA	0.00	2,604	744	672	744	720	744	720	744	744	720	744	720	744	720	744	8,760
					<b>Totals</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>8,760</b>

**Detailed Project Description Attached?**  (Required)

**1 Brake HP (BHP) at Full Load**

The "full load" operating condition is the condition at which the driven equipment operates for the base condition (i.e., without the VFD)

**2 Annual hours that motor runs**

If the % operating loads do not vary between months, then enter the total annual hours that the motor will run at full load, partial load and hours not operating.

**3 Monthly hours that each motor runs**

If the % operating loads vary between months (due to weather conditions or seasonal load), fill in the expected hours that the motor will run each month at full load, partial load and hours not operating.



App No.	0
Rev.	0

**Operating Hours** (see note 4)

24 x 7	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	52	6,156

**Energy Savings**

	Existing (no VFD)	Proposed (VFD)	Savings	Describe how energy numbers were calculated
Annual Electric Energy	217,534 kWh	146,502 kWh	71,031 kWh	see calcs for cells AM15, AN15, AM16, & AN16 (NOTE: values in these cells are per VFD)
Electric Demand (kilowatts)	35 kW	32 kW	3 kW	
Calculations attached	No	No		

**Simple Payback**

Average electric rate (\$/kWh) on the applicable accounts (see note 6)	\$0.08
Estimated annual electric savings	\$5,469
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels	
Incremental cost to implement the project (equipment & installation) (see note 7)	\$39,527.00
Copy of vendor proposal is attached (see note 8)	Yes
Simple Electric Payback in years (see note 9)	7.226913869
<b>Total Payback in years</b>	<b>7.226913869</b>

**4 Operating Hours**

Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

**5 Weeks of Use in Year**

If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why:

Weekdays, not running during holidays, weekends do run approximately 10 weeks out of year

**6 Average electric rate (\$/kWh)**

If you do not know your average electric rate, use \$0.10/kWh.

**7 Incremental cost to implement the project**

Costs exclude self installation costs.

Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

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Name	Prem Dhamija
Company	Emerald Hilton Davis

**Equipment Vendor / Project Engineer Contact Information**

Name	Sid Rose
Company	Cincinnati Belting & Transmission

**Location of Proposed VFD Project**

Site Name	Cincinnati site
Electric Account Number(s)	9600-0753-02
Site Address	2235 Langdon Farm Rd., Cincinnati, OH 45237

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Prescriptive rebate amounts are pre-approved.



Use one worksheet for each type of motor or fan that is being evaluated for a VFD

<b>Driven Equipment</b>	<b>Name</b>	Ross Mixers	<b>Type</b>	Process
<b>Quantity</b>		2		
<b>Brake HP (BHP) at Full Load</b> (see note 1)		45.0		
<b>Nameplate HP</b>		50.0		

<b>App No.</b>	
<b>Rev.</b>	

**Current Equipment Operation without VFD - Input values for ONE driven equipment and its motor.**

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Nameplate HP	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
100	45.0	90%	95 %	35.34	4,860														
%	0.0	0%	%	#DIV/0!															0
%	0.0	0%	%	#DIV/0!															0
%	0.0	0%	%	#DIV/0!															0
Not Running	0.0	0%	NA	0.00	3,900	744	672	744	720	744	720	744	744	720	744	720	744	744	8,760
<b>Totals</b>					<b>8,760</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>

**Proposed Equipment Operation with VFD - Input values for ONE driven equipment and its motor.**

<b>Efficiency of VFD</b>	98 %
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% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Motor Nameplate	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
100	45.0	90%	95 %	35.34															
90	40.5	81%	95 %	31.80	972														0
80	36.0	72%	95 %	28.27															0
70	31.5	63%	95 %	24.74	1944														0
60	27.0	54%	95 %	21.20															0
50	22.5	45%	95 %	17.67	1944														0
40	18.0	36%	95 %	14.13															0
30	13.5	27%	95 %	10.60															0
20	9.0	18%	95 %	7.07															0
10	4.5	9%	95 %	3.53															0
Not Running	0.0	0%	NA	0.00	3,900	744	672	744	720	744	720	744	744	720	744	720	744	744	8,760
<b>Totals</b>					<b>3,900</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>

**Detailed Project Description Attached?**  (Required)

**1 Brake HP (BHP) at Full Load**

The "full load" operating condition is the condition at which the driven equipment operates for the base condition (i.e., without the VFD)

**2 Annual hours that motor runs**

If the % operating loads do not vary between months, then enter the total annual hours that the motor will run at full load, partial load and hours not operating.

**3 Monthly hours that each motor runs**

If the % operating loads vary between months (due to weather conditions or seasonal load), fill in the expected hours that the motor will run each month at full load, partial load and hours not operating.



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**Operating Hours** (see note 4)

24 x 7	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	52	4,860

**Energy Savings**

	Existing (no VFD)	Proposed (VFD)	Savings	Describe how energy numbers were calculated
Annual Electric Energy	171,737 kWh	115,660 kWh	56,077 kWh	see calcs for cells AM15, AN15, AM16, & AN16 (NOTE: values in these cells are per VFD)
Electric Demand (kilowatts)	35 kW	32 kW	3 kW	
Calculations attached	No	No		

**Simple Payback**

Average electric rate (\$/kWh) on the applicable accounts (see note 6)	\$0.08
Estimated annual electric savings	\$4,318
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels	
Incremental cost to implement the project (equipment & installation) (see note 7)	\$39,527.00
Copy of vendor proposal is attached (see note 8)	Yes
Simple Electric Payback in years (see note 9)	9.154090901
<b>Total Payback in years</b>	<b>9.154090901</b>

**4 Operating Hours**

Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

**5 Weeks of Use in Year**

If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why:

Weekdays, not running during holidays, weekends do run approximately 10 weeks out of year

**6 Average electric rate (\$/kWh)**

If you do not know your average electric rate, use \$0.10/kWh.

**7 Incremental cost to implement the project**

Costs exclude self installation costs.

Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

**8 Copy of vendor invoice is attached**

Vendor invoices detailing costs of the project are always required.

New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

**9 Simple Electric Payback**

If the simple payback on the project is less than 1 year, the rebate structure is affected.

Please check that the electric rate is accurate based on history.





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- Rebates are based on electricity conservation only.
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- Incomplete applications will not be reviewed; all fields are required.

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Please enter your information and data into the cells that are shaded.  
Cells in white are locked and cannot be written over.

**Duke Energy Customer Contact Information (Match the information in Application Part 1):**

Name	Prem Dhamija
Company	Emerald Hilton Davis

**Equipment Vendor / Project Engineer Contact Information**

Name	Sid Rose
Company	Cincinnati Belting & Transmission

**Location of Proposed VFD Project**

Site Name	Cincinnati site
Electric Account Number(s)	9600-0753-02
Site Address	2235 Langdon Farm Rd., Cincinnati, OH 45237

Before proceeding with the custom application, please verify that your project is not on the Self-Direct Prescriptive application.

The prescriptive incentive applications can be found at:

<http://www.duke-energy.com/ohio-large-business/smart-saver/mercantile-self-direct.asp>

Prescriptive rebate amounts are pre-approved.



Use one worksheet for each type of motor or fan that is being evaluated for a VFD

<b>Driven Equipment</b>	<b>Name</b>	Ross Mixers	<b>Type</b>	Process
<b>Quantity</b>		1		
<b>Brake HP (BHP) at Full Load</b> (see note 1)		45.0		
<b>Nameplate HP</b>		50.0		

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**Current Equipment Operation without VFD - Input values for ONE driven equipment and its motor.**

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Nameplate HP	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)						
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
100	45.0	90%	95 %	35.34	1,944																			0
%	0.0	0%	%	#DIV/0!																				0
%	0.0	0%	%	#DIV/0!																				0
%	0.0	0%	%	#DIV/0!																				0
Not Running	0.0	0%	NA	0.00	6,816	744	672	744	720	744	720	744	744	720	744	744	720	744	720	744	744	720	744	8,760
					<b>Totals</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>8,760</b>

**Proposed Equipment Operation with VFD - Input values for ONE driven equipment and its motor.**

<b>Efficiency of VFD</b>	98 %
--------------------------	------

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Motor Nameplate	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)						
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
100	45.0	90%	95 %	35.34																				0
90	40.5	81%	95 %	31.80	389																			0
80	36.0	72%	95 %	28.27																				0
70	31.5	63%	95 %	24.74	778																			0
60	27.0	54%	95 %	21.20																				0
50	22.5	45%	95 %	17.67	778																			0
40	18.0	36%	95 %	14.13																				0
30	13.5	27%	95 %	10.60																				0
20	9.0	18%	95 %	7.07																				0
10	4.5	9%	95 %	3.53																				0
Not Running	0.0	0%	NA	0.00	6,816	744	672	744	720	744	720	744	744	720	744	744	720	744	720	744	744	720	744	8,760
					<b>Totals</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>8,760</b>

**Detailed Project Description Attached?**  (Required)

**1 Brake HP (BHP) at Full Load**

The "full load" operating condition is the condition at which the driven equipment operates for the base condition (i.e., without the VFD)

**2 Annual hours that motor runs**

If the % operating loads do not vary between months, then enter the total annual hours that the motor will run at full load, partial load and hours not operating.

**3 Monthly hours that each motor runs**

If the % operating loads vary between months (due to weather conditions or seasonal load), fill in the expected hours that the motor will run each month at full load, partial load and hours not operating.



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**Operating Hours** (see note 4)

24 x 7	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	52	1,944

**Energy Savings**

	Existing (no VFD)	Proposed (VFD)	Savings	Describe how energy numbers were calculated
Annual Electric Energy	68,695 kWh	46,264 kWh	22,431 kWh	
Electric Demand (kilowatts)	35 kW	32 kW	3 kW	
Calculations attached	No	No		

**Simple Payback**

Average electric rate (\$/kWh) on the applicable accounts (see note 6)	\$0.08
Estimated annual electric savings	\$1,727
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels	
Incremental cost to implement the project (equipment & installation) (see note 7)	\$39,527.00
Copy of vendor proposal is attached (see note 8)	Yes
Simple Electric Payback in years (see note 9)	22.88522725
<b>Total Payback in years</b>	<b>22.88522725</b>

**4 Operating Hours**

Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

**5 Weeks of Use in Year**

If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why:

Weekdays, not running during holidays, weekends do run approximately 10 weeks out of year

**6 Average electric rate (\$/kWh)**

If you do not know your average electric rate, use \$0.10/kWh.

**7 Incremental cost to implement the project**

Costs exclude self installation costs.

Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

**8 Copy of vendor invoice is attached**

Vendor invoices detailing costs of the project are always required.

New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

**9 Simple Electric Payback**

If the simple payback on the project is less than 1 year, the rebate structure is affected.

Please check that the electric rate is accurate based on history.



The VFD Worksheet is part 2 of the application. Do not submit this file without submitting a completed Part1 Custom Application document file, which can be found at [www.duke-energy.com](http://www.duke-energy.com).

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Please enter your information and data into the cells that are shaded.  
Cells in white are locked and cannot be written over.

**Duke Energy Customer Contact Information (Match the information in Application Part 1):**

Name	Prem Dhamija
Company	Emerald Hilton Davis

**Equipment Vendor / Project Engineer Contact Information**

Name	Sid Rose
Company	Cincinnati Belting & Transmission

**Location of Proposed VFD Project**

Site Name	Cincinnati site
Electric Account Number(s)	9600-0753-02
Site Address	2235 Langdon Farm Rd., Cincinnati, OH 45237

Before proceeding with the custom application, please verify that your project is not on the Self-Direct Prescriptive application.

The prescriptive incentive applications can be found at:

<http://www.duke-energy.com/ohio-large-business/smart-saver/mercantile-self-direct.asp>

Prescriptive rebate amounts are pre-approved.



Use one worksheet for each type of motor or fan that is being evaluated for a VFD

<b>Driven Equipment</b>	<b>Name</b>	Netzsch Mills	<b>Type</b>	Process
<b>Quantity</b>		2		
<b>Brake HP (BHP) at Full Load</b> (see note 1)		18.0		
<b>Nameplate HP</b>		20.0		

<b>App No.</b>	
<b>Rev.</b>	

**Current Equipment Operation without VFD - Input values for ONE driven equipment and its motor.**

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Nameplate HP	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
100	18.0	90%	95 %	14.13	4,860														
%	0.0	0%	%	#DIV/0!															0
%	0.0	0%	%	#DIV/0!															0
%	0.0	0%	%	#DIV/0!															0
Not Running	0.0	0%	NA	0.00	3,900	744	672	744	720	744	720	744	744	720	744	720	744	744	8,760
<b>Totals</b>					<b>8,760</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>

**Proposed Equipment Operation with VFD - Input values for ONE driven equipment and its motor.**

<b>Efficiency of VFD</b>	98 %
--------------------------	------

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Motor Nameplate	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
100	18.0	90%	95 %	14.13															0
90	16.2	81%	95 %	12.72	486														0
80	14.4	72%	95 %	11.31															0
70	12.6	63%	95 %	9.89	2430														0
60	10.8	54%	95 %	8.48															0
50	9.0	45%	95 %	7.07	1944														0
40	7.2	36%	95 %	5.65															0
30	5.4	27%	95 %	4.24															0
20	3.6	18%	95 %	2.83															0
10	1.8	9%	95 %	1.41															0
Not Running	0.0	0%	NA	0.00	3,900	744	672	744	720	744	720	744	744	720	744	720	744	744	8,760
<b>Totals</b>					<b>3,900</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>

**Detailed Project Description Attached?**  (Required)

**1 Brake HP (BHP) at Full Load**

The "full load" operating condition is the condition at which the driven equipment operates for the base condition (i.e., without the VFD)

**2 Annual hours that motor runs**

If the % operating loads do not vary between months, then enter the total annual hours that the motor will run at full load, partial load and hours not operating.

**3 Monthly hours that each motor runs**

If the % operating loads vary between months (due to weather conditions or seasonal load), fill in the expected hours that the motor will run each month at full load, partial load and hours not operating.



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**Operating Hours** (see note 4)

24 x 7	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	52	4,860

**Energy Savings**

	Existing (no VFD)	Proposed (VFD)	Savings	Describe how energy numbers were calculated
Annual Electric Energy	68,695 kWh	44,862 kWh	23,833 kWh	
Electric Demand (kilowatts)	14 kW	13 kW	1 kW	
Calculations attached	No	No		

**Simple Payback**

Average electric rate (\$/kWh) on the applicable accounts (see note 6)	\$0.08
Estimated annual electric savings	\$1,835
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels	
Incremental cost to implement the project (equipment & installation) (see note 7)	\$10,200.00
Copy of vendor proposal is attached (see note 8)	Yes
Simple Electric Payback in years (see note 9)	5.55818002
<b>Total Payback in years</b>	<b>5.55818002</b>

**4 Operating Hours**

Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

**5 Weeks of Use in Year**

If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why:

Weekdays, not running during holidays, weekends do run approximately 10 weeks out of year

**6 Average electric rate (\$/kWh)**

If you do not know your average electric rate, use \$0.10/kWh.

**7 Incremental cost to implement the project**

Costs exclude self installation costs.

Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

**8 Copy of vendor invoice is attached**

Vendor invoices detailing costs of the project are always required.

New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

**9 Simple Electric Payback**

If the simple payback on the project is less than 1 year, the rebate structure is affected.

Please check that the electric rate is accurate based on history.



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Cells in white are locked and cannot be written over.

**Duke Energy Customer Contact Information (Match the information in Application Part 1):**

Name	Prem Dhamija
Company	Emerald Hilton Davis

**Equipment Vendor / Project Engineer Contact Information**

Name	Sid Rose
Company	Cincinnati Belting & Transmission

**Location of Proposed VFD Project**

Site Name	Cincinnati site
Electric Account Number(s)	9600-0753-02
Site Address	2235 Langdon Farm Rd., Cincinnati, OH 45237

Before proceeding with the custom application, please verify that your project is not on the Self-Direct Prescriptive application.

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Prescriptive rebate amounts are pre-approved.



Use one worksheet for each type of motor or fan that is being evaluated for a VFD

<b>Driven Equipment</b>	<b>Name</b>	Netzsch Mills	<b>Type</b>	Process
<b>Quantity</b>		1		
<b>Brake HP (BHP) at Full Load</b> (see note 1)		18.0		
<b>Nameplate HP</b>		20.0		

<b>App No.</b>	
<b>Rev.</b>	

**Current Equipment Operation without VFD - Input values for ONE driven equipment and its motor.**

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Nameplate HP	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
100	18.0	90%	95 %	14.13	5,832														0
%	0.0	0%	%	#DIV/0!															0
%	0.0	0%	%	#DIV/0!															0
%	0.0	0%	%	#DIV/0!															0
Not Running	0.0	0%	NA	0.00	2,928	744	672	744	720	744	720	744	744	720	744	720	744	744	8,760
					<b>Totals</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>

**Proposed Equipment Operation with VFD - Input values for ONE driven equipment and its motor.**

<b>Efficiency of VFD</b>	98 %
--------------------------	------

% of Full Load BHP of Driven Equipment	BHP of Driven Equipment @ Actual Load (BHP)	Motor output HP as % of Motor Nameplate	Motor Efficiency @ Motor Output HP (%)	Motor Electrical Power Draw (kw)	Annual hours that motor runs (see note 2)	Monthly hours that each motor runs (see note 3)												Yearly Total (hr)	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
100	18.0	90%	95 %	14.13															0
90	16.2	81%	95 %	12.72	583														0
80	14.4	72%	95 %	11.31															0
70	12.6	63%	95 %	9.89	2916														0
60	10.8	54%	95 %	8.48															0
50	9.0	45%	95 %	7.07	2333														0
40	7.2	36%	95 %	5.65															0
30	5.4	27%	95 %	4.24															0
20	3.6	18%	95 %	2.83															0
10	1.8	9%	95 %	1.41															0
Not Running	0.0	0%	NA	0.00	2,928	744	672	744	720	744	720	744	744	720	744	720	744	744	8,760
					<b>Totals</b>	<b>744</b>	<b>672</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>720</b>	<b>744</b>	<b>744</b>	<b>8,760</b>

**Detailed Project Description Attached?**  (Required)

**1 Brake HP (BHP) at Full Load**

The "full load" operating condition is the condition at which the driven equipment operates for the base condition (i.e., without the VFD)

**2 Annual hours that motor runs**

If the % operating loads do not vary between months, then enter the total annual hours that the motor will run at full load, partial load and hours not operating.

**3 Monthly hours that each motor runs**

If the % operating loads vary between months (due to weather conditions or seasonal load), fill in the expected hours that the motor will run each month at full load, partial load and hours not operating.





App No.	0
Rev.	0

**Operating Hours** (see note 4)

24 x 7	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	52	5,832

**Energy Savings**

	Existing (no VFD)	Proposed (VFD)	Savings	Describe how energy numbers were calculated
Annual Electric Energy	82,434 kWh	53,834 kWh	28,599 kWh	
Electric Demand (kilowatts)	14 kW	13 kW	1 kW	
Calculations attached	No	No		

**Simple Payback**

Average electric rate (\$/kWh) on the applicable accounts (see note 6)	\$0.08
Estimated annual electric savings	\$2,202
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels	
Incremental cost to implement the project (equipment & installation) (see note 7)	\$10,200.00
Copy of vendor proposal is attached (see note 8)	Yes
Simple Electric Payback in years (see note 9)	4.631816683
<b>Total Payback in years</b>	<b>4.631816683</b>

**4 Operating Hours**

Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

**5 Weeks of Use in Year**

If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why:

Weekdays, not running during holidays, weekends do run approximately 10 weeks out of year

**6 Average electric rate (\$/kWh)**

If you do not know your average electric rate, use \$0.10/kWh.

**7 Incremental cost to implement the project**

Costs exclude self installation costs.

Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

**8 Copy of vendor invoice is attached**

Vendor invoices detailing costs of the project are always required.

New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

**9 Simple Electric Payback**

If the simple payback on the project is less than 1 year, the rebate structure is affected.

Please check that the electric rate is accurate based on history.

# Ohio Mercantile Self Direct Program

## Application Guide & Cover Sheet

Questions? Call 1-866-380-9580 or visit [www.duke-energy.com](http://www.duke-energy.com).

Email this form along with completed Mercantile Self Direct Prescriptive or Custom applications, proof of payment, energy savings calculations and spec sheets to [SelfDirect@Duke-Energy.com](mailto:SelfDirect@Duke-Energy.com). You may also fax to 1-513-419-5572.

Mercantile customers, defined as using at least 700,000 kWh annually are eligible for the Mercantile Self Direct program. Please indicate mercantile qualification:

- a single Duke Energy Ohio account
- multiple accounts in Ohio (energy usage with other utilities may be counted toward the total)

Please list Duke Energy account numbers below (attach listing of multiple accounts an/or billing history for other utilities as required):

Account Number	Annual Usage	Account Number	Annual Usage
9600-0753-02	21,600,000		

Self Direct rebates are available for completed Custom projects that have not previously received a Duke Energy Smart \$aver® Custom Incentive. Self Direct incentives are applicable to Prescriptive measures that were installed more than 90 days prior to submission to Duke Energy and have not previously received a Duke Energy Prescriptive rebate.

Self Direct Program requirements dictate that certain projects that may be Prescriptive in nature under the Smart \$aver program must be evaluated using the Custom process. Use the table on page two as a guide to determine which Self Direct program fits your project(s). Apply for Self Direct projects using the appropriate application forms in conjunction with this cover sheet. Where Mercantile Self Direct Prescriptive applications are listed, please refer to the measure list on that application. If your measure is not listed, you may be eligible for a Self Direct Custom rebate. Self Direct Custom applications, like Smart \$aver Custom applications, should include detailed analysis of pre-project and post-project energy usage and project costs. Please indicate which type of rebate applications are included in the table provided on page two.

Please check each box to indicate completion of the following program requirements:

<input checked="" type="checkbox"/> All sections of appropriate application(s) are completed	<input checked="" type="checkbox"/> Proof of payment.*	<input checked="" type="checkbox"/> Manufacturer's Spec sheets	<input checked="" type="checkbox"/> Energy model/calculations and detailed inputs for Custom applications
--	--	--	---

\* If a single payment record is intended to demonstrate the costs of both Prescriptive & Custom projects, please include an additional document with an estimated breakout of costs for each Prescriptive and Custom energy conservation measure.

Application Type	Replaced equipment at end of lifetime or because equipment failed**	Replaced fully operational equipment to improve efficiency***	New Construction
Lighting	MSD Custom Part 1 <input type="checkbox"/> Custom Lighting Worksheet <input type="checkbox"/>	MSD Prescriptive Lighting <input type="checkbox"/>	MSD Prescriptive Lighting <input type="checkbox"/>
		MSD Custom Part 1 <input type="checkbox"/> Custom Lighting Worksheet <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> Custom Lighting Worksheet <input type="checkbox"/>
Heating & Cooling	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Prescriptive Heating & Cooling <input type="checkbox"/>
			MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>
Window Films, Programmable Thermostats, & Guest Room Energy Management Systems	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General and/or EMS Worksheet(s) <input type="checkbox"/>	MSD Prescriptive Heating & Cooling <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General and/or EMS Worksheet(s) <input type="checkbox"/>
Chillers & Thermal Storage	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Prescriptive Chillers & Thermal Storage <input type="checkbox"/>
			MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>
Motors & Pumps	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Prescriptive Motors, Pumps & Drives <input type="checkbox"/>
			MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>
VFDs	Not Applicable	MSD Prescriptive Motors, Pumps & Drives <input type="checkbox"/>	MSD Custom Part 1 <input checked="" type="checkbox"/> MSD Custom VFD Worksheet <input checked="" type="checkbox"/>
		MSD Custom Part 1 <input type="checkbox"/> MSD Custom VFD Worksheet <input type="checkbox"/>	
Food Service	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Prescriptive Food Service <input type="checkbox"/>
			MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>
Process	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	MSD Prescriptive Process <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>
		MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	
Energy Management Systems	MSD Custom Part 1 <input type="checkbox"/> MSD Custom EMS Worksheet <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> MSD Custom EMS Worksheet <input type="checkbox"/>	MSD Custom Part 1 <input type="checkbox"/> MSD Custom EMS Worksheet <input type="checkbox"/>
Behavioral*** & No/Low Cost		MSD Custom Part 1 <input type="checkbox"/> MSD Custom General Worksheet <input type="checkbox"/>	

\*\* Under the Self Direct program, failed equipment and equipment at the end of its useful life are evaluated differently than early replacement of fully functioning equipment. **All equipment replacements due to failure or old age will be evaluated via the Custom program.**

\*\*\* Please ensure that you include the age of the replaced equipment for measures classified as "Early Replacement" in your application as well as the estimated date that you would have otherwise replaced the existing equipment if you had not chosen a more energy efficient option.

\*\*\*\* Behavioral energy efficiency and demand reduction projects must be both measurable and verifiable. Provide justification with your application.

# Mercantile Self Direct Nonresidential Custom Rebate Application PART 1



Proposed energy efficiency measures may be eligible for Self-Direct Custom rebates if they clearly reduce electrical consumption and/or demand as compared to the appropriate baseline.

Before you complete this application, please note the following important criteria:

- Submitting this application does not guarantee a rebate will be approved.
- Rebates are based on electricity conservation only.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Incomplete applications cannot be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, beginning on page 6.

## Notes on the Application Process

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact your Duke Energy Ohio, Inc account manager or the Duke Energy Smart Saver® team at 1-866-380-9580.

Every application must include calculations of the baseline electrical usage and the electrical usage of the proposed high-efficiency equipment/system. Monthly calculations are best. You, the Duke Energy Ohio customer, or your equipment vendor / engineer should perform these calculations and submit them to Duke Energy for review. *We strongly encourage the use of modeling software (such as eQuest or comparable) for complex projects.*

Upon receipt of your application, an acknowledgement email will be sent to you with an estimated response time based on an initial assessment of your application. The application review may include some communication to resolve any questions about the project or to request additional information. Applications that are received complete without missing information have a faster review time.

There are two ways to submit your completed application.

Email your scanned form to: [SelfDirect@duke-energy.com](mailto:SelfDirect@duke-energy.com)

Or, fax your form to 513-419-5572

**Mercantile Self Direct  
Nonresidential Custom Rebate Application  
PART 1**



**1. Contact Information (Required)**

Duke Energy Customer Contact Information					
Company Name	Emerald Hilton Davis				
Address	2235 Langdon Farm Rd.				
Project Contact	Prem Dhamija				
City	Cincinnati	State	OH	Zip Code	45237
Title	Senior Electrical Engineer				
Office Phone	513-841-4852	Mobile Phone	513-305-2123	Fax	513-841-3705
E-mail Address	prem.dhamija@emeraldmaterials.com				

Equipment Vendor / Contractor / Architect / Engineer Contact Information	
Company Name	Cincinnati Belting & Transmission

**Mercantile Self Direct  
Nonresidential Custom Rebate Application  
PART 1**



Address	PO Box: 630505				
City	Cincinnati	State	OH	Zip Code	45263-1433
Project Contact	Sid Rose / Jim Gordon				
Title	Inside Saleman / Outside Sales				
Office Phone	513-621-9050	Mobile Phone		Fax	513-621-0549
E-mail Address					
Describe Role	Sales				

<b>Payment Information</b>	
Payee Legal Company Name (as shown on Federal income tax return):	Emerald Hilton Davis, LLC
Mailing Address	2235 Langdon Farm Rd.

**Mercantile Self Direct  
Nonresidential Custom Rebate Application  
PART 1**



City	Cincinnati	State	OH	Zip Code	45237
Type of organization (check one) <input type="checkbox"/> Individual/Sole Proprietor <input checked="" type="checkbox"/> Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Unit of Government <input type="checkbox"/> Non-Profit (non-corporation)					
Payee Federal Tax ID # of Legal Company Name Above:		20-4419928			
Who should receive incentive payment? (select one) <input checked="" type="checkbox"/> Customer <input type="checkbox"/> Vendor (Customer must sign below)					
If the vendor is to receive payment, please sign below: I hereby authorize payment of incentive directly to vendor:					
Customer Signature _____ Date ____/____/____ (mm/dd/yyyy)					

**Mercantile Self Direct  
Nonresidential Custom Rebate Application  
PART 1**



**2. Project Information (Required)**

A. Please indicate project type:

- New Construction
- Expansion at an existing facility
- Replacing equipment due to equipment failure
- Replacing equipment that is estimated to have remaining useful life of 2 years or less
- Replacing equipment that is estimated to have remaining useful life of more than 2 years
- Behavioral, operational and/or procedural programs/projects

B. Please describe your project, or attach a detailed project description that describes the project.

Added VFDs to 1 -150 hp(Kady Mill, PF 700), 1- 50 hp (Scraper, PF 700), 2-40 hp (Meyer

Mixers, PF 70), 6-50 hp (Ross Mixers, PF70, all 6 same process and load curves) and 3-20 hp

(Premier Mills, PF 70, all 3 same process and load curves) to existing motors, each separate process

and load curve is supported by a separate Part 2 incentive application.

C. When did you start and complete implementation?

Start date 03/2008 (mm/yyyy) End date 09/2011 (mm/yyyy)

D. Are you also applying for Self-Direct Prescriptive incentives and, if so, which one(s)<sup>1</sup>?

<sup>1</sup> If your project involves some equipment that is eligible for prescriptive incentives and some equipment that is likely eligible for custom incentives, and if it is feasible to separate the equipment for the energy analysis, then the equipment will be evaluated separately. If it is not feasible to separate the equipment for analysis, then the equipment will be evaluated together in the custom application.



**Mercantile Self Direct  
Nonresidential Custom Rebate Application  
PART 1**



No

E. Please indicate which worksheet(s) you are submitting for this application (check all that apply):

- Lighting
- Variable Frequency Drive (VFD)
- Compressed Air
- Energy Management System (EMS)
- General (for projects not easily submitted using one of the above worksheets)

F. Please tell us if there is anything about your electrical energy projections (either for the baseline or the proposed project) that you are either unsure about or for which you have made significant assumptions. Attach additional sheets as needed.

None

Required: Attach a supplier or contractor invoice or other equivalent information documenting the Implementation Cost for each project listed in your application. (Note: self-install costs cannot be included in the Implementation Cost)

**3. Signature (Required – must be signed by Duke Energy customer)**

**Customer Consent to Release of Personal Information**

I, (insert name) Prem Dhamija, do hereby consent to Duke Energy disclosing my Duke Energy

Ohio, Inc Account Number and Federal Tax ID Number to its subcontractors solely for the purpose of administering Duke Energy Ohio's Mercantile Self-Direct Program. I understand that such subcontractors are contractually bound to otherwise maintain my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number in the strictest of confidence.

I realize that under the rules and regulations of the public utilities commission, I may refuse to allow Duke Energy Ohio, Inc to release the information set forth above. By my signature, I freely give Duke Energy Ohio, Inc permission to release the information designated above.

**Mercantile Self Direct  
Nonresidential Custom Rebate Application  
PART 1**



**Application Signature**

I certify that I meet the eligibility requirements of the Duke Energy Ohio, Inc Mercantile Self Direct Custom Incentives Program and that all information provided within this application is correct to the best of my knowledge. I agree to the terms and conditions set forth for this program. I certify that the numbers, energy savings, and responses shown on this form are correct. Further, I certify that the taxpayer identification number is current and correct. I am not subject to backup withholding because: (a) I am exempt from backup withholding; or (b) I have not been notified by the IRS that I am subject to backup withholding as a result of a failure to report all interest or dividends; or (c) the IRS has notified me that I am no longer subject to backup withholding. I am a U.S. citizen (includes a U.S. resident alien).

  
\_\_\_\_\_  
Duke Energy Ohio, Inc Customer Signature

Print Name Prem Dhamija

Date 09/16/2011

**Mercantile Self Direct  
Nonresidential Custom Rebate Application  
PART 1**



**Checklist for completing the Application**

INCOMPLETE APPLICATIONS WILL RESULT IN DELAYS IN DUKE ENERGY PROCESSING YOUR APPLICATION AND NOTIFYING YOU CONCERNING ANY REBATES. Before submitting the application and the required supplementary information, use the following checklist to ensure that your application is complete and the information in the application is accurate. (Note: this checklist is for your use only – do not submit this checklist with your application)

Section No. & Title	Have You:
1. Contact Information	<input checked="" type="checkbox"/> Completed the contact information for the Duke Energy customer? <input checked="" type="checkbox"/> Completed the contact information for the equipment vendor / project engineer that can answer questions about the technical aspects of the project, if that is a different person than above?
2. Project Information	<input checked="" type="checkbox"/> Answered the questions A-E, including providing a description of your project. <input checked="" type="checkbox"/> Completed and attached the lighting, compressed air, VFD, EMS and/or General worksheet(s)?
3. Signature	<input checked="" type="checkbox"/> Signed your name? <input checked="" type="checkbox"/> Printed your name? <input checked="" type="checkbox"/> Entered the date?
Supplementary information (Required)	<input checked="" type="checkbox"/> Attached a supplier or contractor's invoice or other equivalent information documenting the Implementation Cost for projects listed in your application? (Note: self-install costs cannot be included in the Implementation Cost) <input checked="" type="checkbox"/> (If submitting the General Worksheet) attached calculations documenting the energy usage and energy savings for <b>each</b> project listed in your application?

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact:

- your Duke Energy account manager
- or,
- the Duke Energy Smart \$aver® team at 1-866-380-9580.

# INVOICE

**CBT Company**

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5220859	
Invoice Date	Page
12/14/2007 07:51:39	1 of 1
ORDER NUMBER	
1203587	

**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

**Ship To:**

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 ATTN: PRIM DHAMIJA 70762327  
 CINCINNATI, OH 45237

**\*\*DIRECT SHIPMENT\*\***

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-4601383-65 70762327		1% 10 days net 30	1/13/2008	12/24/2007	53.11
Order Date	Pick Ticket No	Account Manager	Taken by		
12/12/2007 16:18:02	4256531	Jim L. Gordon	CMF		
Quantities					
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID Item Description
					Pricing UOM Unit Size
					Unit Price
					Extended Price

Carrier: UPS GROUND

Tracking #:

1.000	1.000	0.000	EA	20AD065A0AYNANC0 AB	EA	5,311.3500	5,311.35
			1.0	PF70, AC DRIVE, 480 VAC, 3 PH	1.0000		

*Go HP*

Ordered As: 20AD065A0AYNANC0

Total Lines: 1

**SUB-TOTAL:** 5,311.35  
**TOTAL FREIGHT:** 34.11  
**TAX:** 0.00  
**CASH RECEIPTS:** 5,345.46  
**AMOUNT DUE:** 0.00

# INVOICE

**CBT Company**

Remit to: **PO BOX 630505**  
**Cincinnati OH 45263-0505**  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
6037577	
Invoice Date	Page
8/27/2010 08:20:50	1 of 1
ORDER NUMBER	
1587987	

**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

**Ship To:**

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number	Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40020175-UW	1% 10 days net 30	9/26/2010	9/6/2010	70.56

Order Date	Pick Ticket No	Account Manager	Taken by
8/23/2010 16:11:52	5025574	Jim L. Gordon	SAR

Quantities					Item ID Item Description	Pricing UOM Unit Size	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.				

**Carrier:** RELAY EXPRESS

**Tracking #:**

419369

1.000	1.000	0.000	EA	20BD077A0ANNANDO AB	EA	6,907.8000	6,907.80
			1.0	AC DRV, 480 VAC, 3 PH77 A, IP20 / TYPE 1	1.0000		

*SONP*

**Ordered As:** 20BD077A0ANNANDO

1.000	1.000	0.000	EA	20HIMA3 AB	EA	147.9000	147.90
			1.0	PF ARCH. CLASS HIM,LCD DISPLAY,FUL	1.0000		

**Ordered As:** 20HIMA3

Total Lines: 2

**SUB-TOTAL:** 7,055.70  
**TOTAL FREIGHT:** 19.80  
**TAX:** 0.00  
**CASH RECEIPTS:** 7,075.50  
**AMOUNT DUE:** 0.00

# INVOICE

**CBT Company**

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
6096043	
Invoice Date	Page
2/23/2011 15:14:35	1 of 1
ORDER NUMBER	
1629377	

**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 US

**Ship To:**

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount		
CI-40023213-UW		1% 10 days net 30	3/25/2011	3/5/2011	70.82		
Order Date	Pick Ticket No	Account Manager	Taken by				
1/19/2011 16:46:19	5093155	Jim L. Gordon	SAR				
Quantities					Pricing UOM	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID Item Description	Unit Size	

**Delivery Instructions:** call Relay Express when part #20BD077A0ANNANDO arrives. Customer needs this item delivered same day as we receive it.  
*50 HP*

**Carrier:** RELAY EXPRESS **Tracking #:** 492094

1.000	1.000	0.000	EA		20BD077A0ANNANDO AB	EA	7,081.8000	7,081.80
				1.0	AC DRV, 480 VAC, 3 PH77 A, IP20 / TYPE 1	1.0000		

**Ordered As:** 20BD077A0ANNANDO

Total Lines: 1

**SUB-TOTAL:** 7,081.80  
**TOTAL FREIGHT:** 51.89  
**TAX:** 0.00  
**CASH RECEIPTS:** 7,133.69  
**AMOUNT DUE:** 0.00

# INVOICE

**CBT Company**

Remit to: PO BOX 630505  
Cincinnati OH 45263-0505

Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
6118198	
Invoice Date	Page
4/28/2011 07:57:51	1 of 1
ORDER NUMBER	
1656914	

**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
2020 FRONT STREET  
SUITE 100  
CUYAHOGA FALLS, OH 44221  
US

**Ship To:**

EMERALD HILTON DAVIS, LLC  
2235 LANGDON FARM RD.  
CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number	Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40025434-UW	1% 10 days net 30	5/28/2011	5/8/2011	78.56

Order Date	Pick Ticket No	Account Manager	Taken by
4/19/2011 12:28:39	5118612	Jim L. Gordon	SAR

Quantities					Item ID Item Description	Pricing UOM Unit Size	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.				

Carrier: RELAY EXPRESS Tracking #: 519730

1.000	1.000	0.000	EA		20BD077A0ANNAND0 AB	EA	7,081.8000	7,081.80
				1.0	AC DRV, 480 VAC, 3 PH77 A, IP20 / TYPE 1	1.0000		
					<i>50HP</i> Ordered As: 20BD077A0ANNAND0			
1.000	1.000	0.000	EA		20HIMA3 AB	EA	152.2500	152.25
				1.0	PF ARCH. CLASS HIM,LCD DISPLAY,FUL	1.0000		
					Ordered As: 20HIMA3			
1.000	1.000	0.000	EA		13213RA80B AB	EA	438.4800	438.48
				1.0	LINE REACTOR, NEMA 1, 80 AMP	1.0000		
1.000	1.000	0.000	EA		800HUR24 AB	EA	183.5700	183.57
				1.0	30.5MM TYPE 4/4X POTENTIOMETER UNIT	1.0000		
					Ordered As: 800HUR24			

Total Lines: 4

**SUB-TOTAL:** 7,856.10  
**TOTAL FREIGHT:** 19.80  
**TAX:** 0.00  
**CASH RECEIPTS:** 7,875.90  
**AMOUNT DUE:** 0.00

# INVOICE

## CBT Company

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5251557	
Invoice Date	Page
3/25/2008 10:39:53	1 of 1
ORDER NUMBER	
1230744	

### Bill To:

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

### Ship To:

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

Customer ID: 201655

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40001627-UW		1% 10 days net 30	4/24/2008	4/4/2008	65.12
Order Date	Pick Ticket No	Account Manager	Taken by		
3/25/2008 09:33:32	4292358	Jim L. Gordon	CMF		
Quantities					
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID Item Description
					Pricing UOM Unit Size
					Unit Price
					Extended Price

Delivery Instructions: RELAY EXPRESS PRO#118682

Carrier: RELAY EXPRESS

Tracking #:

1.000	1.000	0.000	EA		20BD077A3ANNAND0 AB	EA	6,511.9500	6,511.95
				1.0	AC DRIVE, 480 VAC, 3 PH77 AMPS, IP20 / T	1.0000		

50HP

Total Lines: 1

<b>SUB-TOTAL:</b>	6,511.95
<b>TAX:</b>	0.00
<b>RELAY EXPRESS CBT:</b>	17.71
<b>CASH RECEIPTS:</b>	6,529.66
<b>AMOUNT DUE:</b>	0.00



# INVOICE

## CBT Company

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5951481	
Invoice Date	Page
11/25/2009 09:59:22	1 of 1
ORDER NUMBER	
1513211	

### Bill To:

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

### Ship To:

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

**\*\*DIRECT SHIPMENT\*\***

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number	Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40014298-UW	1% 10 days net 30	12/25/2009	12/5/2009	67.97

Order Date	Pick Ticket No	Account Manager	Taken by
11/20/2009 15:56:45	4924695	Jim L. Gordon	BCG

Quantities					Item ID Item Description	Pricing UOM Unit Size	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.				

Carrier: UPS GROUND

Tracking #:

1.000	1.000	0.000	EA		20BD077A0ANNAND0 AB	EA	6,633.7500	6,633.75
				1.0	AC DRV, 480 VAC, 3 PH77 A, IP20 / TYPE 1	1.0000		

SOMP

Ordered As: 20BD077A0ANNAND0

1.000	1.000	0.000	EA		800H4HZ4R AB	EA	163.5600	163.56
				1.0	PUSH BUTTON ENCL,ROSITE GLASS POLYESTER000			

Total Lines: 2

<b>SUB-TOTAL:</b>	6,797.31
<b>TOTAL FREIGHT:</b>	32.19
<b>TAX:</b>	0.00
<b>CASH RECEIPTS:</b>	6,765.41
<b>TERMS TAKEN:</b>	64.09
<b>AMOUNT DUE:</b>	0.00

\*\*\* REPRINT \*\*\*

# INVOICE

## CBT Company

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5838344	
Invoice Date	Page
9/30/2008 16:21:36	1 of 1
ORDER NUMBER	
1407695	

### Bill To:

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

### Ship To:

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

Customer ID: 201655

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40005783-UW		1% 10 days net 30	10/30/2008	10/10/2008	37.85
Order Date	Pick Ticket No	Account Manager	Taken by		
9/30/2008 15:40:02	4792924	Jim L. Gordon	SAR		
Quantities					
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID Item Description
					Pricing UOM Unit Size
					Unit Price
					Extended Price

**Delivery Instructions:** TAKE TO MAIN ENTRANCE ATTN: PREM DHAMIJA

**Carrier:** RELAY EXPRESS

**Tracking #:**

1.000	1.000	0.000	EA		20AD040A0AYNANCO AB	EA	3,640.9500	3,640.95
				1.0	PF70, AC DRIVE, 480 VAC, 3 PH	1.0000		
					<b>Ordered As:</b> 20AD040A0AYNANCO			
1.000	1.000	0.000	EA		20HIMA3 AB	EA	143.5500	143.55
				1.0	POWERFLEX ARCHITECTURE CLASS HIM, LCD.D000			
					<b>Ordered As:</b> 20HIMA3			

Total Lines: 2

**SUB-TOTAL:** 3,784.50  
**TAX:** 0.00  
**RELAY EXPRESS CBT:** 19.80  
**CASH RECEIPTS:** 3,804.30  
**AMOUNT DUE:** 0.00

# INVOICE

**CBT Company**

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5962709	
Invoice Date	Page
1/8/2010 13:35:21	1 of 1
ORDER NUMBER	
1523272	

**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

**Ship To:**

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number		Terms Description		Net Due Date	Disc Due Date	Discount Amount	
CI-40015117-UW		1% 10 days net 30		2/7/2010	1/18/2010	25.93	
Order Date	Pick Ticket No	Account Manager		Taken by			
1/8/2010 08:06:56	4937650	Jim L. Gordon		SAR			
Quantities					Pricing UOM	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID Item Description	Unit Size	

**Delivery Instructions:** RELAY #333407

**Carrier:** RELAY EXPRESS

**Tracking #:**

1.000	1.000	0.000	EA		20AD027A3AYNANC0 AB	EA	2,509.9500	2,509.95
				1.0	PF70, AC DRIVE, 480 VAC, 3 PH	1.0000		
					<b>Ordered As:</b> 20AD027A3AYNANC0			
1.000	1.000	0.000	EA		AKM9115VAC1 AB	EA	82.6500	82.65
				1.0	115VAC DIGITAL INTERFACE	1.0000		

Total Lines: 2

<b>SUB-TOTAL:</b>	2,592.60
<b>TAX:</b>	0.00
<b>RELAY EXPRESS CBT:</b>	19.80
<b>CASH RECEIPTS:</b>	2,612.40
<b>AMOUNT DUE:</b>	0.00

# INVOICE

**CBT Company**

Remit to: PO BOX 630505  
Cincinnati OH 45263-0505

Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5971269	
Invoice Date	Page
2/4/2010 12:09:44	1 of 1
ORDER NUMBER	
1530550	

**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
2020 FRONT STREET  
SUITE 100  
CUYAHOGA FALLS, OH 44221  
USA

**Ship To:**

EMERALD HILTON DAVIS, LLC  
2235 LANGDON FARM RD.  
CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number	Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40015810-UW	1% 10 days net 30	3/6/2010	2/14/2010	27.19

Order Date	Pick Ticket No	Account Manager	Taken by
2/4/2010 11:43:43	4947661	Jim L. Gordon	SAR

Quantities					Item ID Item Description	Pricing UOM Unit Size	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.				

Carrier: UPS GROUND

Tracking #: 1Z4701950359580921

1.000	1.000	0.000	EA	20AD027A3AYNANCO AB	EA	2,627.4000	2,627.40
				1.0 PF70, AC DRIVE, 480 VAC, 3 PH	1.0000		

20HP

Ordered As: 20AD027A3AYNANCO

1.000	1.000	0.000	EA	AKM9115VAC1 AB	EA	91.3500	91.35
				1.0 115VAC DIGITAL INTERFACE	1.0000		

Ordered As: AKM9115VAC1

Total Lines: 2

**SUB-TOTAL:** 2,718.75  
**TOTAL FREIGHT:** 38.00  
**TAX:** 0.00  
**CASH RECEIPTS:** 2,756.75  
**AMOUNT DUE:** 0.00

# INVOICE

**CBT Company**

Remit to: **PO BOX 630505**  
**Cincinnati OH 45263-0505**  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5983242	
Invoice Date	Page
3/12/2010 16:44:23	1 of 1
ORDER NUMBER	
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**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

**Ship To:**

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number	Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40016556-OW	1% 10 days net 30	4/11/2010	3/22/2010	33.28

Order Date	Pick Ticket No	Account Manager	Taken by
3/8/2010 11:09:51	4961428	Jim L. Gordon	SAR

Quantities					Item ID Item Description	Pricing UOM Unit Size	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.				

Carrier: UPS GROUND      Tracking #: 1Z4701950360087846

1.000	1.000	0.000	EA		20AD034A3AYNANCO AB	EA	3,236.4000	3,236.40
				1.0	PF70, AC DRIVE, 480 VAC, 3 PH	1.0000		
					Ordered As: 20AD034A3AYNANCO			
1.000	1.000	0.000	EA		AKM9115VAC1 AB	EA	91.3500	91.35
				1.0	115VAC DIGITAL INTERFACE	1.0000		

Total Lines: 2

**SUB-TOTAL:** 3,327.75  
**TOTAL FREIGHT:** 36.06  
**TAX:** 0.00  
**CASH RECEIPTS:** 3,363.81  
**AMOUNT DUE:** 0.00

# INVOICE

## CBT Company

Remit to: **PO BOX 630505**  
**Cincinnati OH 45263-0505**  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
6006617	
Invoice Date	Page
5/26/2010 07:10:08	1 of 1
ORDER NUMBER	
1561203	

### Bill To:

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

### Ship To:

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

**\*\*DIRECT SHIPMENT\*\***

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40018204-OW		1% 10 days net 30	6/25/2010	6/5/2010	32.36
Order Date	Pick Ticket No	Account Manager	Taken by		
5/24/2010 11:37:31	4989506	Jim L. Gordon	SAR		
Quantities					
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID Item Description
					Pricing UOM Unit Size
					Unit Price
					Extended Price

Carrier: UPS GROUND

Tracking #:

1.000	1.000	0.000	EA		20AD034A3AYNANC0 AB	EA	3,236.4000	3,236.40
					1.0 PF70, AC DRIVE, 480 VAC, 3 PH	1.0000		

**25HP**

Ordered As: 20AD034A3AYNANC0

Total Lines: 1

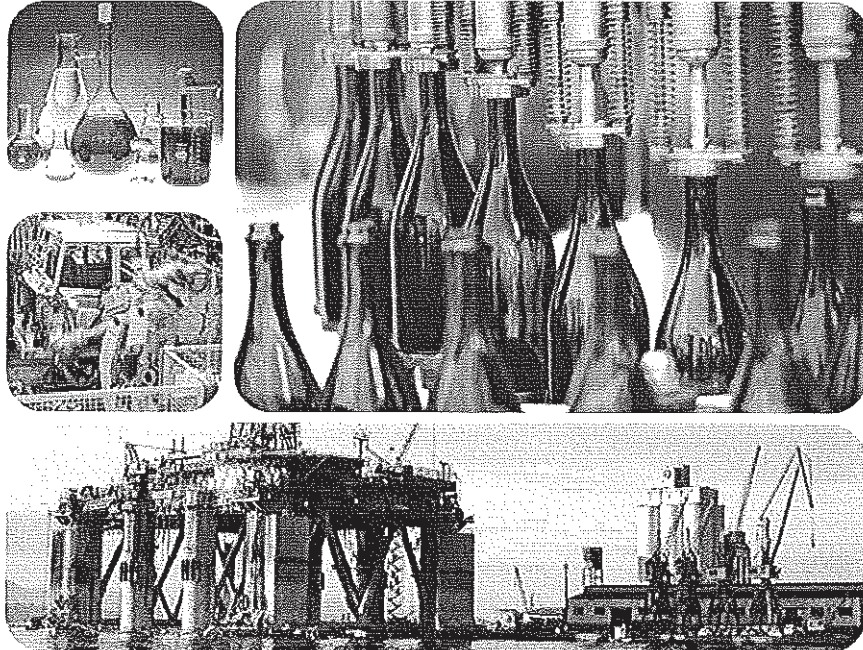
**SUB-TOTAL:** 3,236.40  
**TOTAL FREIGHT:** 21.24  
**TAX:** 0.00  
**CASH RECEIPTS:** 3,257.64  
**AMOUNT DUE:** 0.00

## **PowerFlex 70 AC Drives**

User Manual














Standard Control Firmware 2.xxx

Enhanced Control Firmware 2.xxx...4.xxx



## Supplemental Drive Information

### Specifications

PowerFlex 70 Compliance with Laws, Standards, and Agency Requirements			
Category	Frames		Compliance
	A...E 240...480V	A...E 600V	
Agency Listings, Certifications, or Tests	✓	✓	 Listed to UL508C and CAN/CSA C22.2 No. 14-05 Configured drives may be listed to UL508A
	✓	✓	 TÜV Rheinland Certificate T72041027 01 tested to EN 50178
	✓		 TÜV Rheinland Certificate of a Competent Body AV 72061059 0001 for compliance with EMC Directive (89/336/EEC)
	✓		 TÜV Rheinland Certificate 969/EZ 166.01/06 Safe Off Option satisfies requirements for Category 3 safety function according to EN 954-1
	✓		 EPRI Quality Star Certificates SEMIF47.116 for SEMI F47 compliance, 480V units tested 
	✓	✓	 American Bureau of Shipping MA Certificate 08-HS303172A/1-PDA for auxiliary services on AB Classed vessels and offshore platforms
	✓		 Lloyd's Register Type Approval Certificate 08 / 60014 (marine certification)
	✓	✓	 RINA Type Approval Certificate ELE283205CS (marine certification)
	✓	✓	 Tested by Trentec to be compliant with AC156 Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components and 2003 International Building Code for worst-case seismic level for USA excluding site class F
	✓	✓	 Type 4X enclosure NSF Listed to meet Criteria C2 for splash and non food zones
Rockwell Automation Certifications	✓	✓	 Certified by Rockwell Automation to be in conformity with the essential requirements of the applicable European Directives and the standards referenced below have been applied: 2006/95/EC (Low Voltage Directive) EN 50178 Electronic Equipment for Use in Power Installations
	✓		2004/108/EC (EMC Directive) EN 61800-3 Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods
	✓		 Certified by Rockwell Automation to be in conformity with the requirements of the applicable Australian legislation and standards referenced below: IEC 61800-3
Designed to Meet Applicable Requirements	✓	✓	NFPA 70 - US National Electric Code
	✓	✓	NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems
	✓	✓	IEC 61800-2 Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency AC power drive systems



A-2 Supplemental Drive Information

Category	Specification						
Protection	Drive	200-208V	240V	380/400	480V	600V	690V
	AC Input Overvoltage Trip:	247VAC	285VAC	475VAC	570VAC	690VAC	
	AC Input Undervoltage Trip:	120VAC	138VAC	233VAC	280VAC	345VAC	
	Bus Overvoltage Trip:	405VDC	405VDC	810VDC	810VDC	1013VDC	
	Bus Undervoltage Output Shutoff:	300VDC	300VDC	407V DC	407V DC	508V DC	
	Bus Undervoltage Fault Level:	160VDC	160VDC	300VDC	300VDC	375VDC	
	Nominal Bus Voltage:	281VDC	324VDC	540VDC	648VDC	810VDC	
	<b>All Drives</b>						
Heat Sink Thermistor:	Monitored by microprocessor overtemp trip						
Drive Overcurrent Trip							
Software Current Limit:	20...160% of rated current						
Hardware Current Limit:	200% of rated current (typical)						
Instantaneous Current Limit:	220...300% of rated current (dependent on drive rating)						
Line transients:	up to 6000 volts peak per IEEE C62.41-1991						
Control Logic Noise Immunity:	Showering arc transients up to 1500V peak						
Power Ride-Thru:	15 milliseconds at full load						
Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical						
Ground Fault Trip:	Phase-to-ground on drive output						
Short Circuit Trip:	Phase-to-phase on drive output						
Environment	Altitude:	1000 m (3300 ft) max. without derating					
	Maximum Surrounding Air Temperature without derating:						
	IP20, NEMA/UL Type 1:	0...50 °C (32...122 °F)					
	Flange Mount:	0...50 °C (32...122 °F)					
	IP66, NEMA/UL Type 4X/12:	0...40 °C (32...104 °F)					
	Cooling Fan Operation						
	Frames A and C:	Fan operates when power is applied.					
	Frames B, D and E:	Fan operates when power is applied and in Run condition.					
	Storage Temperature (all const.):	-40...70 °C (-40...158 °F)					
	Atmosphere	Important: Drive <b>must not</b> be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.					
Relative Humidity:	5...95% non-condensing						
Shock:	15 g peak for 11 ms duration (±1.0 ms)						
Vibration:	0.152 mm (0.006 in.) displacement, 1 g peak						

Category	Specification	
Electrical	Voltage Tolerance:	-10% of minimum, +10% of maximum. See page C-17 for Full Power and Operating Range.
	Frequency Tolerance:	47-63 Hz.
	Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation provides 50% of rated current.
	Displacement Power Factor (all drives):	0.98 across speed range.
	Efficiency:	97.5% at rated amps, nominal line volts.
	Maximum Short Circuit Rating:	200,000 Amps symmetrical.
	Max. Short Circuit Current Rating: Using Recommended Fuse or Circuit Breaker Type	Maximum short circuit current rating to match specified fuse/circuit breaker capability.

Category	Specification	
Control	Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives.
	Carrier Frequency:	2, 3, 4, 5, 6, 7, 8, 9 & 10 kHz 2, 4, 8 & 12 kHz Drive rating based on 4 kHz.
	Output Voltage Range:	0 to rated motor voltage
	Output Frequency Range:	0...400 Hz  . 0...500 Hz  .
	Frequency Accuracy Digital Input: Analog Input:	Within ±0.01% of set output frequency. Within ±0.4% of maximum output frequency.
	Frequency Control - Speed Regulation	with Slip Compensation (V/Hz Mode) 0.5% of base speed across 40:1 speed range 40:1 operating range 10 rad/sec bandwidth
		with Slip Compensation (Sensorless Vector Mode) 0.5% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth
		with feedback (Sensorless Vector Mode) 0.001% of base speed across 40:1 speed range 0.1% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth
	Speed Control - Speed Regulation	without feedback (Vector Control Mode) 0.1% of base speed across 120:1 speed range 120:1 operating range 30 rad/sec bandwidth
		with feedback (Vector Control Mode) 0.001% of base speed across 120:1 speed range 1000:1 operating range 125 rad/sec bandwidth
	Torque Regulation	without feedback +/-10% with feedback +/-5%
	Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability and vector control.
	Stop Modes:	Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Fast Brake, Ramp-to-Hold and S-curve.
	Accel/Decel:	Two independently programmable accel & decel times. Each time may be programmed from 0-3600 seconds in 0.1 sec. increments
Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 3 seconds	
Current Limit Capability:	Proactive Current Limit programmable from 20 to 160% of rated output current. Independently programmable proportional and integral gain.	
Electronic Motor Overload Protection:	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 12.	
Encoder	Type:	Incremental, dual channel
	Supply:	5V/12V Configurable +/-5%
	Quadrature:	90° +/-27°
	Duty Cycle:	50% +10%
	Requirements	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), single-ended or differential and capable of supplying a minimum of 10 mA per channel. The Encoder Interface Board accepts 5V or 12V DC square-wave with a minimum high state voltage of 3.5V DC (5V mode) and 7.0V DC (12V mode). Maximum low state voltage is 1V DC (for both 5V and 12V modes). Maximum input frequency is 250 kHz.

A-4 Supplemental Drive Information

IP20, NEMA/UL Type 1 Watts Loss (Rated Load, Speed & PWM)<sup>(1)</sup>

Voltage	ND HP	External Watts	Internal Watts	Total Watts Loss
208V	0.5	12.2	19.2	31.4
	1.0	30.7	20.5	51.2
	2.0	44.6	22.6	67.2
	3.0	67.3	25.4	92.7
	5.0	141.3	33.2	174.5
	7.5	205.7	34.2	239.9
	10	270.4	48.1	318.5
	15	385.6	40.3	425.9
	20	494.6	44.9	539.5
	25	650.7	51.6	702.3
240V	0.5	12.2	19.2	31.4
	1.0	30.7	20.5	51.2
	2.0	44.6	22.6	67.2
	3.0	67.3	25.4	92.7
	5.0	141.3	33.2	174.5
	7.5	205.7	34.2	239.9
	10	270.4	48.1	318.5
	15	385.6	40.3	425.9
	20	494.6	44.9	539.5
	25	650.7	51.6	702.3
400V	0.37	11.5	17.9	29.4
	0.75	27.8	19.5	47.3
	1.5	43.6	21.6	65.2
	2.2	64.6	24	88.6
	4.0	99.5	28.2	127.7
	5.5	140	27.8	167.8
	7.5	193.3	32	225.3
	11	305.4	34.2	339.6
	15	432.9	42.9	475.8
	18.5	363.8	40.5	404.3
	22	396.8	41.5	438.3
	30	500.8	50	550.8
	37	632	57.7	689.7
480V	0.5	11.5	17.9	29.4
	1.0	27.8	19.5	47.3
	2.0	43.6	21.6	65.2
	3.0	64.6	24	88.6
	5.0	99.5	28.2	127.7
	7.5	140	27.8	167.8
	10	193.3	32	225.3
	15	305.4	34.2	339.6
	20	432.9	42.9	475.8
	25	363.8	40.5	404.3
	30	396.8	41.5	438.3
	40	500.8	50	550.8
	50	632	57.7	689.7
600V	0.5	11.5	17.9	29.4
	1.0	27.8	19.5	47.3
	2.0	43.6	21.6	65.2
	3.0	64.6	24	88.6
	5.0	99.5	28.2	127.7
	7.5	140	27.8	167.8
	10	193.3	32	225.3
	15	305.4	34.2	339.6
	20	432.9	42.9	475.8
	25	281.4	42.4	323.8
	30	311.9	43.4	355.3
	40	389.9	51.8	441.7
	50	501.4	59.9	561.3

<sup>(1)</sup> Worst case condition including HIM and Communication Module

## Communication Configurations

### Typical Programmable Controller Configurations

**Important:** If block transfers are programmed to continuously write information to the drive, care must be taken to properly format the block transfer. If attribute 10 is selected for the block transfer, values will be written only to RAM and will not be saved by the drive. This is the preferred attribute for continuous transfers. If attribute 9 is selected, each program scan will complete a write to the drives non-volatile memory (EEPROM). Since the EEPROM has a fixed number of allowed writes, continuous block transfers will quickly damage the EEPROM. Do Not assign attribute 9 to continuous block transfers. Refer to the individual communications adapter User Manual for additional details.



Logic Command/Status Words

Figure A.1 Logic Command Word

Logic Bits																Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Stop <sup>(1)</sup>	0 = Not Stop 1 = Stop
															x	Start <sup>(1)(2)</sup>	0 = Not Start 1 = Start
														x		Jog	0 = Not Jog 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Present Direction
									x							Local Control	0 = No Local Control 1 = Local Control
									x							MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Use Accel Time 1 10 = Use Accel Time 2 11 = Use Present Time
				x	x											Decel Rate	00 = No Command 01 = Use Decel Time 1 10 = Use Decel Time 2 11 = Use Present Time
x	x	x														Reference Select <sup>(3)</sup>	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

- (1) A "0 = Not Stop" condition (logic 0) must first be present before a "1 = Start" condition will start the drive. The Start command acts as a momentary Start command. A "1" will start the drive, but returning to "0" will not stop the drive.
- (2) This Start will not function if a digital input (parameters 361-366) is programmed for 2-Wire Control (option 7, 8 or 9).
- (3) This Reference Select will not function if a digital input (parameters 361-366) is programmed for "Speed Sel 1, 2 or 3" (option 15, 16 or 17). When using the Logic Command Word for the speed reference selection, always set Bit 12, 13 or 14. Note that Reference Selection is "Exclusive Ownership" see [Reference Owner] on page 3-53.

# INVOICE

## CBT Company

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5865146	
Invoice Date	Page
1/9/2009 07:15:46	1 of 1
ORDER NUMBER	
1415587	

**\*\*DIRECT SHIPMENT\*\***

**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

**Ship To:**

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount		
CI-40006421-UW		1% 10 days net 30	2/8/2009	1/19/2009	236.50		
Order Date	Pick Ticket No	Account Manager	Taken by				
10/29/2008 10:23:14	4824546	Jim L. Gordon	BCG				
Quantities					Pricing UOM	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID Item Description	Unit Size	

**Delivery Instructions:** JASON MAYS TO ASSEMBLE AND DELIVER

**Carrier:** BEST WAY

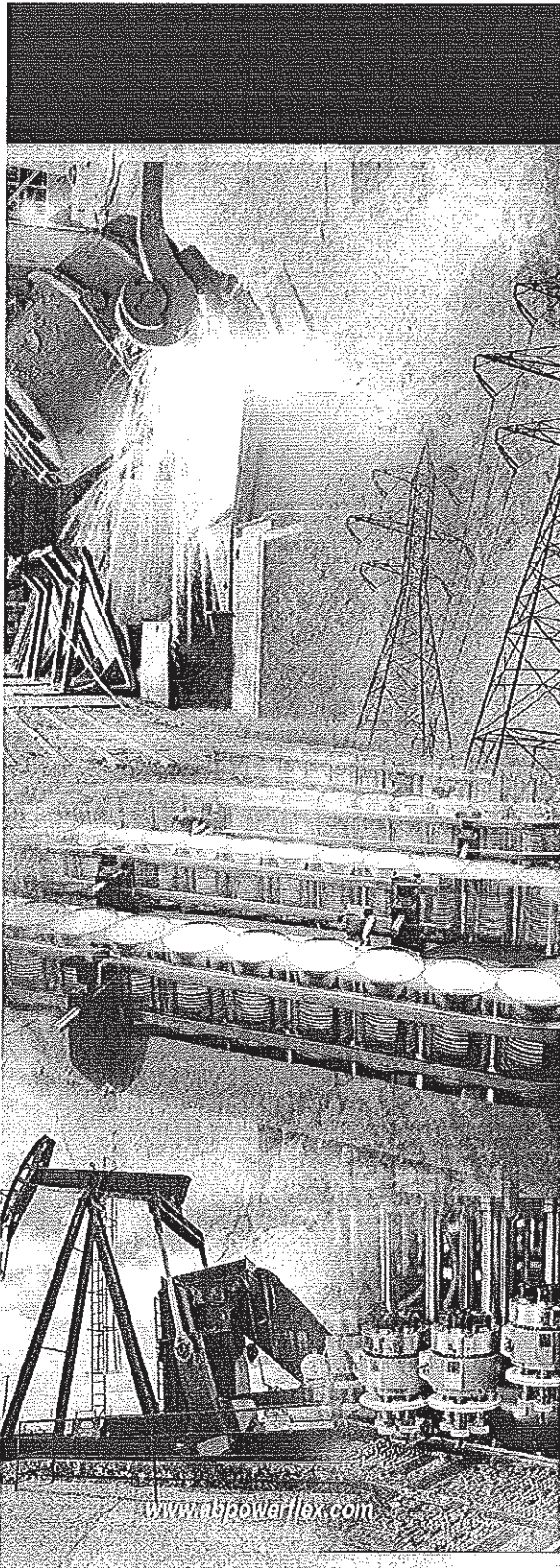
**Tracking #:**

Ordered	Shipped	Remaining	UOM	Unit Size	Item ID	Item Description	Pricing UOM	Unit Price	Extended Price
1.000	1.000	0.000	EA		21BD248HJANNANDONNNNH	AB	EA	23,650.1000	23,650.10
				1.0	150 HP NEMA 12 CONFIGURED	INVERTER	1.0000		

Total Lines: 1

**SUB-TOTAL:** 23,650.10  
**TAX:** 0.00  
**CASH RECEIPTS:** 23,650.10  
**AMOUNT DUE:** 0.00

\*\*\* REPRINT \*\*\*



 **Allen-Bradley**

# **PowerFlex<sup>®</sup>** **700**

**Adjustable Frequency AC Drive  
Series A**

Standard and Vector Control

**Firmware Versions**

Standard Control: xxx.x - 3.001

Vector Control: xxx.x - 3.002

**User Manual**




**Rockwell  
Automation**

[www.abpowerflex.com](http://www.abpowerflex.com)

## Supplemental Drive Information

For information on . .	See page . .
Specifications	A-1
Communication Configurations	A-4
Output Devices	A-7
Drive, Fuse & Circuit Breaker Ratings	A-7
Dimensions	A-15
Frame Cross Reference	A-22

### Specifications

Category	Specification
Agency Certification	 Listed to UL508C and CAN/CSA-C2.2 No. 14-M91.
	 Marked for all applicable European Directives <sup>(1)</sup> EMC Directive (89/336/EEC) EN 61800-3 Adjustable Speed electrical power drive systems Low Voltage Directive (73/23/EEC) EN 50178 Electronic Equipment for use in Power Installations
	 Certified to AS/NZS, 1997 Group 1, Class A.
The drive is also designed to meet the following specifications: NFPA 70 - US National Electrical Code NEMA ICS 3.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems. IEC 146 - International Electrical Code.	

<sup>(1)</sup> Applied noise impulses may be counted in addition to the standard pulse train causing erroneously high [Pulse Freq] readings.

Category	Specification																																										
Protection	<table border="1"> <thead> <tr> <th>Drive</th> <th>200-208V</th> <th>240V</th> <th>380/400</th> <th>480V</th> <th>600V</th> <th>690V</th> </tr> </thead> <tbody> <tr> <td>AC Input Overvoltage Trip:</td> <td>247VAC</td> <td>285VAC</td> <td>475VAC</td> <td>570VAC</td> <td>690VAC</td> <td></td> </tr> <tr> <td>AC Input Undervoltage Trip:</td> <td>120VAC</td> <td>138VAC</td> <td>233VAC</td> <td>280VAC</td> <td>345VAC</td> <td></td> </tr> <tr> <td>Bus Overvoltage Trip:</td> <td>405VDC</td> <td>405VDC</td> <td>810VDC</td> <td>810VDC</td> <td>1013VDC</td> <td></td> </tr> <tr> <td>Bus Undervoltage Shutoff/Fault:</td> <td>153VDC</td> <td>153VDC</td> <td>305VDC</td> <td>305VDC</td> <td>381VDC</td> <td></td> </tr> <tr> <td>Nominal Bus Voltage:</td> <td>281VDC</td> <td>324VDC</td> <td>540VDC</td> <td>648VDC</td> <td>810VDC</td> <td></td> </tr> </tbody> </table>	Drive	200-208V	240V	380/400	480V	600V	690V	AC Input Overvoltage Trip:	247VAC	285VAC	475VAC	570VAC	690VAC		AC Input Undervoltage Trip:	120VAC	138VAC	233VAC	280VAC	345VAC		Bus Overvoltage Trip:	405VDC	405VDC	810VDC	810VDC	1013VDC		Bus Undervoltage Shutoff/Fault:	153VDC	153VDC	305VDC	305VDC	381VDC		Nominal Bus Voltage:	281VDC	324VDC	540VDC	648VDC	810VDC	
	Drive	200-208V	240V	380/400	480V	600V	690V																																				
	AC Input Overvoltage Trip:	247VAC	285VAC	475VAC	570VAC	690VAC																																					
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	Bus Undervoltage Shutoff/Fault:	153VDC	153VDC	305VDC	305VDC	381VDC																																					
	Nominal Bus Voltage:	281VDC	324VDC	540VDC	648VDC	810VDC																																					
<b>All Drives</b>																																											
Heat Sink Thermistor:	Monitored by microprocessor overtemp trip																																										
Drive Overcurrent Trip																																											
Software Overcurrent Trip:	200% of rated current (typical)																																										
Hardware Overcurrent Trip:	220-300% of rated current (dependent on drive rating)																																										
Line transients:	up to 6000 volts peak per IEEE C62.41-1991																																										



A-2 Supplemental Drive Information

Category	Specification				
Protection <i>(continued)</i>	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak			
	Power Ride-Thru:	15 milliseconds at full load			
	Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical			
	Ground Fault Trip:	Phase-to-ground on drive output			
	Short Circuit Trip:	Phase-to-phase on drive output			
Environment	Altitude:	1000 m (3300 ft) max. without derating			
	Maximum Surrounding Air Temperature without Derating: IP20, NEMA Type 1:	0 to 50 degrees C (32 to 122 degrees F), typical. See pages A-8 through A-13 for exceptions.			
	Storage Temperature (all const.):	-40 to 70 degrees C (-40 to 158 degrees F)			
	Atmosphere:	Important: Drive <b>must not</b> be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.			
	Relative Humidity:	5 to 95% non-condensing			
	Shock:	15G peak for 1 ms duration ( $\pm 1.0$ ms)			
	Vibration:	0.152 mm (0.006 in.) displacement, 1G peak			
	Sound:	Frame	Fan Speed	Sound Level	Note: Sound pressure level is measured at 2 meters.
		0	30 CFM	58 dB	
		1	30 CFM	59 dB	
		2	50 CFM	57 dB	
3		120 CFM	61 dB		
4		190 CFM	59 dB		
5		200 CFM	71 dB		
6	300 CFM	72 dB			
Electrical	Voltage Tolerance:	See page C-24 for full power and operating range.			
	Frequency Tolerance:	47-63 Hz.			
	Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation provides 50% of rated current.			
	Displacement Power Factor:	0.98 across entire speed range.			
	Efficiency:	97.5% at rated amps, nominal line volts.			
	Maximum Short Circuit Rating:	200,000 Amps symmetrical.			
Actual Short Circuit Rating:	Determined by AIC rating of installed fuse/circuit breaker.				
Control	Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives (refer to the <i>Derating Guidelines</i> in the PowerFlex Reference Manual). The drive can be supplied as 6 pulse or 12 pulse in a configured package.			
	Carrier Frequency:	2, 4, 8 & 10 kHz. Drive rating based on 4 kHz (see pages A-8 through A-13 for exceptions).			
	Output Voltage Range:	0 to rated motor voltage			
	Output Frequency Range:	Standard Control – 0 to 400 Hz., Vector Control – 0 to 420 Hz			
	Frequency Accuracy Digital Input: Analog Input:	Within $\pm 0.01\%$ of set output frequency. Within $\pm 0.4\%$ of maximum output frequency.			

Category	Specification																								
Control <i>(continued)</i>	Frequency Control: <table border="0" style="width: 100%;"> <tr> <td style="width: 60%;">Speed Regulation - w/Slip Compensation (Volts per Hertz Mode)</td> <td style="text-align: right;"><b>Standard</b></td> </tr> <tr> <td>0.5% of base speed across 40:1 speed range</td> <td style="text-align: right;"><b>Vector</b></td> </tr> <tr> <td>40:1 operating range</td> <td></td> </tr> <tr> <td>10 rad/sec bandwidth</td> <td></td> </tr> <tr> <td>Speed Regulation - w/Slip Compensation (Sensorless Vector Mode)</td> <td style="text-align: right;"><b>Standard</b></td> </tr> <tr> <td>0.5% of base speed across 80:1 speed range</td> <td style="text-align: right;"><b>Vector</b></td> </tr> <tr> <td>80:1 operating range</td> <td></td> </tr> <tr> <td>20 rad/sec bandwidth</td> <td></td> </tr> <tr> <td>Speed Regulation - w/Feedback (Sensorless Vector Mode)</td> <td style="text-align: right;"><b>Vector</b></td> </tr> <tr> <td>0.1% of base speed across 80:1 speed range</td> <td></td> </tr> <tr> <td>80:1 operating range</td> <td></td> </tr> <tr> <td>20 rad/sec bandwidth</td> <td></td> </tr> </table>	Speed Regulation - w/Slip Compensation (Volts per Hertz Mode)	<b>Standard</b>	0.5% of base speed across 40:1 speed range	<b>Vector</b>	40:1 operating range		10 rad/sec bandwidth		Speed Regulation - w/Slip Compensation (Sensorless Vector Mode)	<b>Standard</b>	0.5% of base speed across 80:1 speed range	<b>Vector</b>	80:1 operating range		20 rad/sec bandwidth		Speed Regulation - w/Feedback (Sensorless Vector Mode)	<b>Vector</b>	0.1% of base speed across 80:1 speed range		80:1 operating range		20 rad/sec bandwidth	
	Speed Regulation - w/Slip Compensation (Volts per Hertz Mode)	<b>Standard</b>																							
	0.5% of base speed across 40:1 speed range	<b>Vector</b>																							
	40:1 operating range																								
	10 rad/sec bandwidth																								
	Speed Regulation - w/Slip Compensation (Sensorless Vector Mode)	<b>Standard</b>																							
	0.5% of base speed across 80:1 speed range	<b>Vector</b>																							
	80:1 operating range																								
	20 rad/sec bandwidth																								
	Speed Regulation - w/Feedback (Sensorless Vector Mode)	<b>Vector</b>																							
	0.1% of base speed across 80:1 speed range																								
	80:1 operating range																								
20 rad/sec bandwidth																									
Speed Control:	<table border="0" style="width: 100%;"> <tr> <td style="width: 60%;">Speed Regulation - w/o Feedback (Vector Control Mode)</td> <td style="text-align: right;"><b>Vector</b></td> </tr> <tr> <td>0.1% of base speed across 120:1 speed range</td> <td></td> </tr> <tr> <td>120:1 operating range</td> <td></td> </tr> <tr> <td>50 rad/sec bandwidth</td> <td></td> </tr> <tr> <td>Speed Regulation - w/Feedback (Vector Control Mode)</td> <td style="text-align: right;"><b>Vector</b></td> </tr> <tr> <td>0.001% of base speed across 120:1 speed range</td> <td></td> </tr> <tr> <td>1000:1 operating range</td> <td></td> </tr> <tr> <td>250 rad/sec bandwidth</td> <td></td> </tr> </table>	Speed Regulation - w/o Feedback (Vector Control Mode)	<b>Vector</b>	0.1% of base speed across 120:1 speed range		120:1 operating range		50 rad/sec bandwidth		Speed Regulation - w/Feedback (Vector Control Mode)	<b>Vector</b>	0.001% of base speed across 120:1 speed range		1000:1 operating range		250 rad/sec bandwidth									
Speed Regulation - w/o Feedback (Vector Control Mode)	<b>Vector</b>																								
0.1% of base speed across 120:1 speed range																									
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0.001% of base speed across 120:1 speed range																									
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250 rad/sec bandwidth																									
Torque Regulation:	<table border="0" style="width: 100%;"> <tr> <td style="width: 60%;">Torque Regulation - w/o Feedback</td> <td style="text-align: right;"><b>Vector</b></td> </tr> <tr> <td>±10%, 600 rad/sec bandwidth</td> <td></td> </tr> <tr> <td>Torque Regulation - w/Feedback</td> <td style="text-align: right;"><b>Vector</b></td> </tr> <tr> <td>±5%, 2500 rad/sec bandwidth</td> <td></td> </tr> </table>	Torque Regulation - w/o Feedback	<b>Vector</b>	±10%, 600 rad/sec bandwidth		Torque Regulation - w/Feedback	<b>Vector</b>	±5%, 2500 rad/sec bandwidth																	
Torque Regulation - w/o Feedback	<b>Vector</b>																								
±10%, 600 rad/sec bandwidth																									
Torque Regulation - w/Feedback	<b>Vector</b>																								
±5%, 2500 rad/sec bandwidth																									
Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability. PF700 adds Vector Control.																								
Stop Modes:	Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Ramp-to-Hold and S-curve.																								
Accel/Decel:	Two independently programmable accel and decel times. Each time may be programmed from 0 - 3600 seconds in 0.1 second increments.																								
Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 3 seconds																								
Current Limit Capability:	Proactive Current Limit programmable from 20 to 160% of rated output current. Independently programmable proportional and integral gain.																								
Electronic Motor Overload Protection:	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 12.																								
Encoder	Type:	Incremental, dual channel																							
	Supply:	12V, 250 mA. 12V, 10 mA minimum inputs isolated with differential transmitter, 250 kHz maximum.																							
	Quadrature:	90°, ±27 degrees at 25 degrees C.																							
	Duty Cycle:	50%, +10%																							
	Requirements:	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), 8-15V DC output, single-ended or differential and capable of supplying a minimum of 10 mA per channel. Maximum input frequency is 250 kHz. The Encoder Interface Board accepts 12V DC square-wave with a minimum high state voltage of 7.0V DC (12 volt encoder). Maximum low state voltage is 0.4V DC.																							

## Communication Configurations

### Typical Programmable Controller Configurations

**Important:** If block transfers are programmed to continuously write information to the drive, care must be taken to properly format the block transfer. If attribute 10 is selected for the block transfer, values will be written only to RAM and will not be saved by the drive. This is the preferred attribute for continuous transfers. If attribute 9 is selected, each program scan will complete a write to the drives non-volatile memory (EEPROM). Since the EEPROM has a fixed number of allowed writes, continuous block transfers will quickly damage the EEPROM. Do Not assign attribute 9 to continuous block transfers. Refer to the individual communications adapter User Manual for additional details.

**Logic Command/Status Words**

Figure A.1 Logic Command Word

Logic Bits																Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Stop <sup>(1)</sup>	0 = Not Stop 1 = Stop
															x	Start <sup>(1)(2)</sup>	0 = Not Start 1 = Start
															x	Jog	0 = Not Jog 1 = Jog
															x	Clear Faults	0 = Not Clear Faults 1 = Clear Faults
											x	x				Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Present Direction
											x					Local Control	0 = No Local Control 1 = Local Control
											x					MOP Increment	0 = Not Increment 1 = Increment
											x	x				Accel Rate	00 = No Command 01 = Use Accel Time 1 10 = Use Accel Time 2 11 = Use Present Time
																Decel Rate	00 = No Command 01 = Use Decel Time 1 10 = Use Decel Time 2 11 = Use Present Time
																Reference Select <sup>(3)</sup>	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
																MOP Decrement	0 = Not Decrement 1 = Decrement

- (1) A "0 = Not Stop" condition (logic 0) must first be present before a "1 = Start" condition will start the drive. The Start command acts as a momentary Start command. A "1" will start the drive, but returning to "0" will not stop the drive.
- (2) This Start will not function if a digital input (parameters 361-366) is programmed for 2-Wire Control (option 7, 8 or 9).
- (3) This Reference Select will not function if a digital input (parameters 361-366) is programmed for "Speed Sel 1, 2 or 3" (option 15, 16 or 17). Note that Reference Selection is "Exclusive Ownership" see [Reference Owner] on page 3-52.



Figure A.2 Logic Status Word

Logic Bits																Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Ready	0 = Not Ready 1 = Ready
															x	Active	0 = Not Active 1 = Active
															x	Command Direction	0 = Reverse 1 = Forward
															x	Actual Direction	0 = Reverse 1 = Forward
															x	Accel	0 = Not Accelerating 1 = Accelerating
															x	Decel	0 = Not Decelerating 1 = Decelerating
															x	Alarm	0 = No Alarm 1 = Alarm
															x	Fault	0 = No Fault 1 = Fault
															x	At Speed	0 = Not At Reference 1 = At Reference
																Local Control <sup>(1)</sup>	000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Reserved 111 = No Local
x	x	x	x													Reference Source	0000 = Ref A Auto 0001 = Ref B Auto 0010 = Preset 2 Auto 0011 = Preset 3 Auto 0100 = Preset 4 Auto 0101 = Preset 5 Auto 0110 = Preset 6 Auto 0111 = Preset 7 Auto 1000 = Term Blk Manual 1001 = DPI 1 Manual 1010 = DPI 2 Manual 1011 = DPI 3 Manual 1100 = DPI 4 Manual 1101 = DPI 5 Manual 1110 = Reserved 1111 = Jog Ref

<sup>(1)</sup> See "Owners" on page 3-50 for further information.

# INVOICE

## CBT Company

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5865160	
Invoice Date	Page
1/9/2009 08:13:00	1 of 1
ORDER NUMBER	
1415587	

**\*\*DIRECT SHIPMENT\*\***

### Bill To:

EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

### Ship To:

EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount
CI-40006421-UW		1% 10 days net 30	2/8/2009	1/19/2009	117.65
Order Date	Pick Ticket No	Account Manager	Taken by		
10/29/2008 10:23:14	4824564	Jim L. Gordon	BCG		
Quantities					
Ordered	Shipped	Remaining	UOM Unit Size	Item ID Item Description	Pricing UOM Unit Price Extended Price

**Delivery Instructions:** JASON MAYS TO ASSEMBLE AND DELIVER

**Carrier:** BEST WAY

**Tracking #:**

1.000	1.000	0.000	EA	21BD077HJANNANDONNNNHHD- AB	EA	11,764.7000	11,764.70
			1.0	50 HP NEMA 12 CONFIGURED INVERTER	1.0000		

Total Lines: 1

**SUB-TOTAL:** 11,764.70  
**TAX:** 0.00  
**CASH RECEIPTS:** 11,764.70  
**AMOUNT DUE:** 0.00

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# INVOICE

## CBT Company

Remit to: PO BOX 630505  
 Cincinnati OH 45263-0505  
 Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5861684	
Invoice Date	Page
12/22/2008 12:01:08	1 of 1
ORDER NUMBER	
1415587	

**\*\*DIRECT SHIPMENT\*\***

**Bill To:**  
 EMERALD PERFORMANCE MATERIALS, LLC  
 2020 FRONT STREET  
 SUITE 100  
 CUYAHOGA FALLS, OH 44221  
 USA

**Ship To:**  
 EMERALD HILTON DAVIS, LLC  
 2235 LANGDON FARM RD.  
 CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount		
CI-40006421-UW		1% 10 days net 30	1/21/2009	1/1/2009	99.19		
Order Date	Pick Ticket No	Account Manager	Taken by				
10/29/2008 10:23:14	4820315	Jim L. Gordon	BCG				
Quantities					Pricing UOM	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID	Item Description	Unit Size

**Delivery Instructions:** JASON MAYS TO ASSEMBLE AND DELIVER

**Carrier:** BEST WAY

**Trucking #:**

Ordered	Shipped	Remaining	UOM	Unit Size	Disp.	Item ID	Item Description	UOM	Unit Price	Extended Price
2.000	1.000	0.000	EA			21AD065GJAYNAND0NNNNHHD- AB	EA		9,918.7000	9,918.70
				1.0		40 HP NEMA 12 CONFIGURED INVERTER	1.0000			

Total Lines: 1

**SUB-TOTAL:** 9,918.70  
**TAX:** 0.00  
**CASH RECEIPTS:** 9,918.70  
**AMOUNT DUE:** 0.00

# INVOICE

**CBT Company**

Remit to: PO BOX 630505  
Cincinnati OH 45263-0505  
Phone: 513-621-9050 Fax: 513-621-0929



INVOICE	
5862048	
Invoice Date	Page
12/23/2008 08:33:09	1 of 1
ORDER NUMBER	
1415587	

**\*\*DIRECT SHIPMENT\*\***

**Bill To:**

EMERALD PERFORMANCE MATERIALS, LLC  
2020 FRONT STREET  
SUITE 100  
CUYAHOGA FALLS, OH 44221  
USA

**Ship To:**

EMERALD HILTON DAVIS, LLC  
2235 LANGDON FARM RD.  
CINCINNATI, OH 45237

Attn: Marianne Danszczak

Ordered By: Prem Dhamija

**Customer ID: 201655**

PO Number		Terms Description	Net Due Date	Disc Due Date	Discount Amount		
CI-40006421-UW		1% 10 days net 30	1/22/2009	1/2/2009	99.19		
Order Date	Pick Ticket No	Account Manager	Taken by				
10/29/2008 10:23:14	4820638	Jim L. Gordon	BCG				
Quantities					Pricing UOM	Unit Price	Extended Price
Ordered	Shipped	Remaining	UOM Unit Size	Disp.	Item ID Item Description	Unit Size	

**Delivery Instructions:** JASON MAYS TO ASSEMBLE AND DELIVER

**Carrier:** BEST WAY

**Tracking #:**

Ordered	Shipped	Remaining	UOM	Unit Size	Disp.	Item ID	Item Description	UOM	Unit Price	Extended Price
2.000	1.000	0.000	EA			21AD065GJAYNAND0NNNNHID- AB	40 HP NEMA 12 CONFIGURED INVERTER	EA	9,918.7000	9,918.70
				1.0				1.0000		

Total Lines: 1

**SUB-TOTAL:** 9,918.70  
**TOTAL FREIGHT:** 172.17  
**TAX:** 0.00  
**CASH RECEIPTS:** 10,090.87  
**AMOUNT DUE:** 0.00

\*\*\* REPRINT \*\*\*

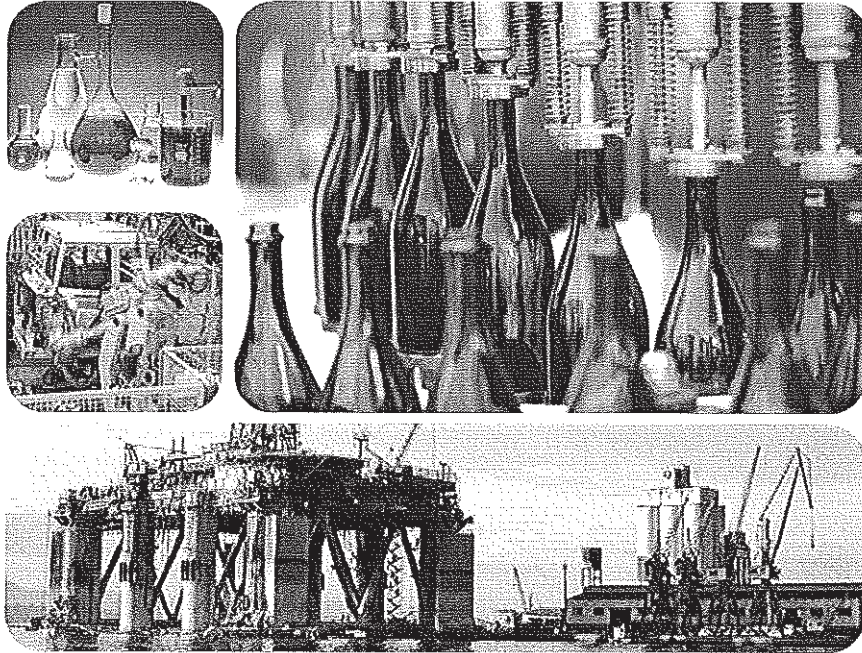


## **PowerFlex 70 AC Drives**














User Manual

Standard Control Firmware 2.xxx

Enhanced Control Firmware 2.xxx...4.xxx



## Supplemental Drive Information Specifications

PowerFlex 70 Compliance with Laws, Standards, and Agency Requirements			
Category	Frames		Compliance
	A...E 240...480V	A...E 600V	
Agency Listings, Certifications, or Tests	✓	✓	 Listed to UL508C and CAN/CSA C22.2 No. 14-05 Configured drives may be listed to UL508A
	✓	✓	 TÜV Rheinland Certificate T72041027 01 tested to EN 50178
	✓		 TÜV Rheinland Certificate of a Competent Body AV 72061059 0001 for compliance with EMC Directive (89/336/EEC)
	✓		 TÜV Rheinland Certificate 968/EZ 166.01/06 Safe Off Option satisfies requirements for Category 3 safety function according to EN 954-1
	✓		 EPRI Quality Star Certificates SEMIF47.116 for SEMI F47 compliance, 480V units tested 
	✓	✓	 American Bureau of Shipping MA Certificate 08-HS303172A/1-PDA for auxiliary services on AB Classed vessels and offshore platforms
	✓		 Lloyd's Register Type Approval Certificate 08 / 60014 (marine certification)
	✓	✓	 RINA Type Approval Certificate ELE283205CS (marine certification)
	✓	✓	 Tested by Trentec to be compliant with AC156 Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components and 2003 International Building Code for worst-case seismic level for USA excluding site class F
	✓	✓	 Type 4X enclosure NSF Listed to meet Criteria C2 for splash and non food zones
Rockwell Automation Certifications	✓	✓	 Certified by Rockwell Automation to be in conformity with the essential requirements of the applicable European Directives and the standards referenced below have been applied: 2006/95/EC (Low Voltage Directive) EN 50178 Electronic Equipment for Use in Power Installations
	✓		2004/108/EC (EMC Directive) EN 61800-3 Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods
	✓		 Certified by Rockwell Automation to be in conformity with the requirements of the applicable Australian legislation and standards referenced below: IEC 61800-3
Designed to Meet Applicable Requirements	✓	✓	NFPA 70 - US National Electric Code
	✓	✓	NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems
	✓	✓	IEC 61800-2 Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency AC power drive systems

A-2 Supplemental Drive Information

Category	Specification						
Protection	Drive	200-208V	240V	380/400	480V	600V	690V
	AC Input Overvoltage Trip:	247VAC	285VAC	475VAC	570VAC	690VAC	
	AC Input Undervoltage Trip:	120VAC	138VAC	233VAC	280VAC	345VAC	
	Bus Overvoltage Trip:	405VDC	405VDC	810VDC	810VDC	1013VDC	
	Bus Undervoltage Output Shutoff:	300VDC	300VDC	407V DC	407V DC	508V DC	
	Bus Undervoltage Fault Level:	160VDC	160VDC	300VDC	300VDC	375VDC	
	Nominal Bus Voltage:	281VDC	324VDC	540VDC	648VDC	810VDC	
<b>All Drives</b>							
	Heat Sink Thermistor:	Monitored by microprocessor overtemp trip					
	Drive Overcurrent Trip						
	Software Current Limit:	20...160% of rated current					
	Hardware Current Limit:	200% of rated current (typical)					
	Instantaneous Current Limit:	220...300% of rated current (dependent on drive rating)					
	Line transients:	up to 6000 volts peak per IEEE C62.41-1991					
	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak					
	Power Ride-Thru:	15 milliseconds at full load					
	Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical					
	Ground Fault Trip:	Phase-to-ground on drive output					
	Short Circuit Trip:	Phase-to-phase on drive output					
Environment	Altitude:	1000 m (3300 ft) max. without derating					
	Maximum Surrounding Air Temperature without derating:						
	IP20, NEMA/UL Type 1:	0...50 °C (32...122 °F)					
	Flange Mount:	0...50 °C (32...122 °F)					
	IP66, NEMA/UL Type 4X/12:	0...40 °C (32...104 °F)					
	Cooling Fan Operation						
	Frames A and C:	Fan operates when power is applied.					
	Frames B, D and E:	Fan operates when power is applied and in Run condition.					
	Storage Temperature (all const.):	-40...70 °C (-40...158 °F)					
	Atmosphere	Important: Drive <b>must not</b> be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.					
Relative Humidity:	5...95% non-condensing						
Shock:	15 g peak for 11 ms duration (±1.0 ms)						
Vibration:	0.152 mm (0.006 in.) displacement, 1 g peak						

Category	Specification	
Electrical	Voltage Tolerance:	-10% of minimum, +10% of maximum. See page C-17 for Full Power and Operating Range.
	Frequency Tolerance:	47-63 Hz.
	Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation provides 50% of rated current.
	Displacement Power Factor (all drives):	0.98 across speed range.
	Efficiency:	97.5% at rated amps, nominal line volts.
	Maximum Short Circuit Rating:	200,000 Amps symmetrical.
	Max. Short Circuit Current Rating: Using Recommended Fuse or Circuit Breaker Type	Maximum short circuit current rating to match specified fuse/circuit breaker capability.

Category	Specification		
Control	Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives.	
	Carrier Frequency:	2, 3, 4, 5, 6, 7, 8, 9 & 10 kHz <b>Standard</b> 2, 4, 8 & 12 kHz <b>ECO</b> Drive rating based on 4 kHz.	
	Output Voltage Range:	0 to rated motor voltage	
	Output Frequency Range:	0...400 Hz <b>Standard</b> , 0...500 Hz <b>ECO</b>	
	Frequency Accuracy Digital Input: Analog Input:	Within ±0.01% of set output frequency. Within ±0.4% of maximum output frequency.	
	Frequency Control - Speed Regulation	with Slip Compensation (V/Hz Mode)	0.5% of base speed across 40:1 speed range 40:1 operating range 10 rad/sec bandwidth
		with Slip Compensation (Sensorless Vector Mode)	0.5% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth
		with feedback (Sensorless Vector Mode) <b>ECO</b>	0.001% of base speed across 40:1 speed range 0.1% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth
	Speed Control - Speed Regulation	without feedback (Vector Control Mode) <b>ECO</b>	0.1% of base speed across 120:1 speed range 120:1 operating range 30 rad/sec bandwidth
		with feedback (Vector Control Mode) <b>ECO</b>	0.001% of base speed across 120:1 speed range 1000:1 operating range 125 rad/sec bandwidth
	Torque Regulation	without feedback +/-10% <b>ECO</b>	
		with feedback +/-5% <b>ECO</b>	
	Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability and vector control.	
Stop Modes:	Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Fast Brake, Ramp-to-Hold and S-curve.		
Accel/Decel:	Two independently programmable accel & decel times. Each time may be programmed from 0-3600 seconds in 0.1 sec. increments		
Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 3 seconds		
Current Limit Capability:	Proactive Current Limit programmable from 20 to 160% of rated output current. Independently programmable proportional and integral gain.		
Electronic Motor Overload Protection:	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 12.		
Encoder	Type:	Incremental, dual channel	
	Supply:	5V/12V Configurable +/-5%	
	Quadrature:	90° +/-27°	
	Duty Cycle:	50% +/-10%	
	Requirements	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), single-ended or differential and capable of supplying a minimum of 10 mA per channel. The Encoder Interface Board accepts 5V or 12V DC square-wave with a minimum high state voltage of 3.5V DC (5V mode) and 7.0V DC (12V mode). Maximum low state voltage is 1V DC (for both 5V and 12V modes). Maximum input frequency is 250 kHz.	

A-4 Supplemental Drive Information

IP20, NEMA/UL Type 1 Watts Loss (Rated Load, Speed & PWM)<sup>(1)</sup>

Voltage	ND HP	External Watts	Internal Watts	Total Watts Loss
208V	0.5	12.2	19.2	31.4
	1.0	30.7	20.5	51.2
	2.0	44.6	22.6	67.2
	3.0	67.3	25.4	92.7
	5.0	141.3	33.2	174.5
	7.5	205.7	34.2	239.9
	10	270.4	48.1	318.5
	15	385.6	40.3	425.9
	20	494.6	44.9	539.5
	25	650.7	51.6	702.3
240V	0.5	12.2	19.2	31.4
	1.0	30.7	20.5	51.2
	2.0	44.6	22.6	67.2
	3.0	67.3	25.4	92.7
	5.0	141.3	33.2	174.5
	7.5	205.7	34.2	239.9
	10	270.4	48.1	318.5
	15	385.6	40.3	425.9
	20	494.6	44.9	539.5
	25	650.7	51.6	702.3
400V	0.37	11.5	17.9	29.4
	0.75	27.8	19.5	47.3
	1.5	43.6	21.6	65.2
	2.2	64.6	24	88.6
	4.0	99.5	28.2	127.7
	5.5	140	27.8	167.8
	7.5	193.3	32	225.3
	11	305.4	34.2	339.6
	15	432.9	42.9	475.8
	18.5	363.8	40.5	404.3
	22	396.8	41.5	438.3
	30	500.8	50	550.8
	37	632	57.7	689.7
480V	0.5	11.5	17.9	29.4
	1.0	27.8	19.5	47.3
	2.0	43.6	21.6	65.2
	3.0	64.6	24	88.6
	5.0	99.5	28.2	127.7
	7.5	140	27.8	167.8
	10	193.3	32	225.3
	15	305.4	34.2	339.6
	20	432.9	42.9	475.8
	25	363.8	40.5	404.3
	30	396.8	41.5	438.3
	40	500.8	50	550.8
	50	632	57.7	689.7
600V	0.5	11.5	17.9	29.4
	1.0	27.8	19.5	47.3
	2.0	43.6	21.6	65.2
	3.0	64.6	24	88.6
	5.0	99.5	28.2	127.7
	7.5	140	27.8	167.8
	10	193.3	32	225.3
	15	305.4	34.2	339.6
	20	432.9	42.9	475.8
	25	281.4	42.4	323.8
	30	311.9	43.4	355.3
	40	389.9	51.8	441.7
	50	501.4	59.9	561.3

(1) Worst case condition including HIM and Communication Module

## Communication Configurations

### Typical Programmable Controller Configurations

**Important:** If block transfers are programmed to continuously write information to the drive, care must be taken to properly format the block transfer. If attribute 10 is selected for the block transfer, values will be written only to RAM and will not be saved by the drive. This is the preferred attribute for continuous transfers. If attribute 9 is selected, each program scan will complete a write to the drives non-volatile memory (EEPROM). Since the EEPROM has a fixed number of allowed writes, continuous block transfers will quickly damage the EEPROM. Do Not assign attribute 9 to continuous block transfers. Refer to the individual communications adapter User Manual for additional details.



Logic Command/Status Words

Figure A.1 Logic Command Word

Logic Bits																Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Stop <sup>(1)</sup>	0 = Not Stop 1 = Stop
															x	Start <sup>(1)(2)</sup>	0 = Not Start 1 = Start
															x	Jog	0 = Not Jog 1 = Jog
															x	Clear Faults	0 = Not Clear Faults 1 = Clear Faults
											x	x				Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Present Direction
											x					Local Control	0 = No Local Control 1 = Local Control
											x					MOP Increment	0 = Not Increment 1 = Increment
											x	x				Accel Rate	00 = No Command 01 = Use Accel Time 1 10 = Use Accel Time 2 11 = Use Present Time
																Decel Rate	00 = No Command 01 = Use Decel Time 1 10 = Use Decel Time 2 11 = Use Present Time
																Reference Select <sup>(3)</sup>	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
																MOP Decrement	0 = Not Decrement 1 = Decrement

- (1) A "0 = Not Stop" condition (logic 0) must first be present before a "1 = Start" condition will start the drive. The Start command acts as a momentary Start command. A "1" will start the drive, but returning to "0" will not stop the drive.
- (2) This Start will not function if a digital input (parameters 361-366) is programmed for 2-Wire Control (option 7, 8 or 9).
- (3) This Reference Select will not function if a digital input (parameters 361-366) is programmed for "Speed Sel 1, 2 or 3" (option 15, 16 or 17). When using the Logic Command Word for the speed reference selection, always set Bit 12, 13 or 14. Note that Reference Selection is "Exclusive Ownership" see [Reference Owner] on page 3-53.

**Customer Confirmation -This Is NOT New Construction**  
**Detailed Project Description**

Pigment Dispersion process. Manufacturing of varnish as a vehicle for black print ink, 150 hp motor drives a Kady Mill, mixing the varnish. Process runs ~300 days a year @ 16 hours a day. Added a VFD to decrease electric usage as process demand warrants. Did not replace the existing motor.

Manufacturing of black ink, 2-40 hp motors that drive Meyer Mixers for the water side of the black ink process. Process runs ~300 days a year @ 16 hours per day. Added VFDs to decrease electric usage as process demand warrants. Did not replace the existing motors. Motors run two spindles which operate in the same tank (rotating at the same time), they run in opposite directions to enhance mixing.

Manufacturing for food coloring, 3-20 hp motors that drive Netzsch Mills. Process runs: 2 run 75% of 24 hours a day for 270 days a year, 1 runs 90% of 24 hours in a day for 270 days a year. Added a VFD to decrease electric usage as process demand warrants. Did not replace the existing motors.

Manufacturing of black print ink, 50 hp motor drives a scraper for the pre-dispersion process. Process runs ~300 days a year @ 16 hours a day. Added a VFD to decrease electric usage as process demand warrants. Did not replace the existing motor.

Manufacturing for dispersion process to make grease and transoxide, 6-50 hp motors that drive Ross Mixers. Process runs are expressed as a percentage of hours in a 24 hour day at 270 days of the year: for 3 motors - run 95% of a 24 hour day\* 270 days of the year, 2 - run 75% \* 270, 1 - runs 30% \* 270. Added VFDs to decrease electric usage as process demand warrants. Did not replace the existing motors.