

# 2019 Variable Frequency Drives Commercial & Industrial Retrofit



## ***Instructions for completing the Retrofit VARIABLE FREQUENCY DRIVE (VFD) Incentive Worksheet***

### **General Notes:**

1. A vendor proposal is required for an Incentive. The VFD Installation Information, page 3 may also be required.
2. VFDs offer a method of significantly reducing the energy consumed by fans, centrifugal pumps, and other motor-driven machinery operated under varying loads. For VFD applications not covered here, use the Custom Application.
3. Existing systems to be retrofit must have varying load operations such as variable flow or pressure regulation. Existing fan and pump operations using on/off cycling controls are not eligible for VFD Incentives. Systems with constant speed and variable load operation (such as conveyors) are not eligible for VFD Incentives.
4. Check with your specific utility for any harmonics or power quality requirements.
5. If power factor correction capacitors are present, they could be adversely affected by the VFD. The customer's design engineer should address this issue.
6. The Incentive, in conjunction with all other sources of funding, cannot exceed the total project cost.

### **Eligibility Requirements**

1. Eligibility requirements can be found in the "Application Code" box in the back side of the Incentive form.
2. Existing VAV fans with inlet guide vanes and forward curve fan blades are not eligible for Incentives.
3. Fans / pumps motors must operate a minimum of 2,000 hours per year.
4. Applicants must demonstrate significant load diversity that will result in savings through motor speed variation.
5. The VFD speed must be automatically controlled by differential pressure, flow, temperature or other method.

### **VFD Installation Information Form**

Check with your utility representative to determine if the attached VFD Installation Information Form needs to be completed and submitted.

### **Pre-Installation:**

1. Review the Incentive eligibility requirements.
2. Review the proposed equipment specifications to confirm it meets the minimum efficiency requirements.
3. Provide to the utility representative the manufacturer's equipment specifications and confirm that it meets the minimum efficiency requirements
  - a. Motor HP (size) horsepower
  - b. Fan or Pump ID identification (example: AC-2, Air handler #2, Chilled water pump #1)
  - c. Area Served - location (example: Lobby, Cafeteria, 2nd floor offices)
  - d. Fan or Pump Application Code (Table 1 on the VFD worksheet)
  - e. Verify the fan is not forward curve type.
  - f. Annual Hours of Operation

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If controlled horsepower falls between two listed values, interpolate to determine the Incentive.

## Explanation of how to fill out table:

| RETROFIT VFD INCENTIVE WORKSHEET |                         |   |                                |   |   |                                       |  |   |
|----------------------------------|-------------------------|---|--------------------------------|---|---|---------------------------------------|--|---|
| Item                             | Motor HP                | Fan or Pump ID                          | Area Served                    | Application Code <sup>1</sup>                             | Control Parameters <sup>2</sup>                                     | Motor Efficiency                      | Annual Hours of Operation <sup>3</sup> | Incentive (\$) <sup>4</sup>                           |
| <i>Ex.</i>                       | 25                      | AC-3                                    | Lobby                          | RFA   | DT  | 91%                                   | 4,400                                  | \$2,050   |
|                                  | <b>Motor name plate</b> | <b>Equipment identification or name</b> | <b>Location of pump or fan</b> | <b>Refer to the Application Table 1 on Incentive Form</b> | <b>Refer to the Controls Parameter on Table 2 on Incentive Form</b> | Refer to Manufacture's specifications | <b>Must Exceed 2000 hrs.</b>           | <b>Refer to the Incentive Table on Incentive Form</b> |

## Post-Installation:

Utility Representative must verify that:

1. The equipment including the VFD, motor and line reactors has been installed and is operable.
2. The VFD equipment matches the Incentive application information. If the equipment has changed from what was approved for the initial Incentive offer, the substituted equipment/material specifications must be submitted and reviewed by the utility to verify compliance with technical requirements and approved before an Incentive is considered.
3. Verify that the prior control is disabled
  - a. inlet or outlet dampers are fully open or removed
  - b. inlet or outlet valves are fully open or removed, bypass loop valved off or removed
4. Observe operation of drive, motor, and driven equipment.
5. If possible, observe variation in drive speed with changing operating conditions.
6. The invoice or proof of payment has been submitted.
7. The Utility Representative & Customer have signed / dated the post installation inspection block on the Incentive form.

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## VFD Installation Information Form

### Equipment Information

Item ID reference number found in the Incentive worksheet table: \_\_\_\_\_  
 Fan or Pump ID(s) \_\_\_\_\_ (Example: FW-1, Feedwater Pump #1; CW-1, Condenser Water Pump #1)  
 VFD Application: \_\_\_\_\_ (Use list of applications from page one, or describe other)  
 Building Type: \_\_\_\_\_ (Office, Hotel/Motel, Healthcare, Elementary/High School,  
 College/University, Warehouse, Restaurant, Manufacturing, Other ?)  
 Type of area(s) served by fan(s) or pump(s): \_\_\_\_\_  
 Equipment served by the fan (s) or pump (s): \_\_\_\_\_  
 If fan, note type: \_\_\_\_\_ (centrifugal, forward curve, backward curve, axial, etc)  
 Fan or Pump Nominal HP \_\_\_\_\_ (if multiple motors, list individual HP's) Nameplate motor efficiency(s)  
 Fan or Pump Manufacturer: \_\_\_\_\_ Model: \_\_\_\_\_  
 Full Load Design Conditions: Flow \_\_\_\_\_ (CFM, GPM) Pressure \_\_\_\_\_ (inches static, feet of water, PSI, other?)  
 Existing Controls: \_\_\_\_\_ (discharge damper, inlet guide vanes, outlet control valve, bypass valve, etc.)  
 Existing setpoint: \_\_\_\_\_ ( inches static, feet of water, PSI, other ?)

### Operating Hours

The fan or pump operates the following hours: (Example: 0600 to 1800)  

|                          |  |                          |  |
|--------------------------|--|--------------------------|--|
| <u>Summer</u>            |  | <u>Winter</u>            |  |
| Weekdays _____ to _____  |  | Weekdays _____ to _____  |  |
| Saturdays _____ to _____ |  | Saturdays _____ to _____ |  |
| Sundays _____ to _____   |  | Sundays _____ to _____   |  |

 Number of shifts per weekday: \_\_\_\_\_ Number of shifts per weekend day: \_\_\_\_\_

### Motor Load

**Option 1:** (retrofit): Measured input power under full load: \_\_\_\_\_ kW, (true RMS power) \_\_\_\_\_ Power Factor  
**Option 2:** (retrofit): Measured current and voltage under full load: \_\_\_\_\_ Amps \_\_\_\_\_ Volts  
 Load calculation = \_\_\_\_\_ volts X \_\_\_\_\_ amps X \_\_\_\_\_ PF = \_\_\_\_\_ kW  
**Option 3:** (retrofit or new): Estimated Fan or Pump Load: \_\_\_\_\_ %, Estimated Power \_\_\_\_\_ kW  
 If estimating load, provide description, assumptions and formula used to calculate power: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Proposed Operations

The proposed VFD will be automatically controlled to maintain the following set points:  
 Flow \_\_\_\_\_ (CFM, GPM, other?) Pressure \_\_\_\_\_ (inches static, feet of water, PSI, other?)  
 Other? (describe): \_\_\_\_\_  
 \_\_\_\_\_

**Estimated VFD speed in future operations**

| % Load        | Summer      |             | Winter      |             |
|---------------|-------------|-------------|-------------|-------------|
|               | Week-day    | Week-end    | Week-day    | Week-end    |
| 90% to 100%   |             |             |             |             |
| 80% to 90%    |             |             |             |             |
| 60% to 80%    |             |             |             |             |
| 20% to 60%    |             |             |             |             |
| Off           |             |             |             |             |
| <b>Totals</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> | <b>100%</b> |