Custom Variable Frequency Drive

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The Efficiency Maine Business Program provides incentives for the purchase and installation of premium efficiency Variable Frequency Drive equipment in new construction projects, renovation projects, and for the replacement of functioning, but less efficient, existing equipment. Custom projects submitted under the Business Program must include a detailed technical analysis showing base electrical energy use and proposed savings. The accompanying worksheets will provide your company's engineering staff or assisting contractor with step-by-step guidelines for analysis beyond what is listed in Table 4 of the Custom Variable Frequency Drive Incentive Application.

This instruction guide is intended to present information regarding the operations of the existing and proposed motor system in correlation with the installation of Variable Frequency Drives. Please feel free to present the energy savings analysis in an alternative format, but make sure that the current and proposed operation of the motor systems are accurately represented in the analysis. However, analyses presenting one-line calculations using average loads for the entire year are not recommended, and supplementary information will be requested in order to process the application.

If you require assistance, please contact Efficiency Maine at 866-376-2463, or by email at efficiencymainec&i@ers-inc.com. All forms and guidelines are downloadable at efficiencymaine.com.

Following you will find:

The first worksheet, page 2, is for presenting the information regarding the existing motor systems and their operational settings. (See example on page 4.)

The second worksheet, page 3, is for presenting the information regarding the proposed Variable Frequency Drive and their intended operational settings. (See example on page 5.)

Please note that, along with the two form documents and the energy savings analysis, we do require the following supporting documents to complete the application package:

Data logging results (CFM, GPM, Amps, or kW, preferably in graphical plot format) along with the underlying assumptions (such as sampling rates, equipment logged, location etc). We recommend that the data logging be conducted over a minimum period of one regular production week.

Please review the attached example analysis for a custom variable frequency drive retrofit.

HOW AND WHERE TO SEND YOUR APPLICATION AND PROOF OF PURCHASE

Please mail or fax all documentation and forms to: Efficiency Maine Business Program | 323 State Street, Suite 2 | Augusta ME 04330

VFD Information Sheet
Worksheet 1

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FACILITY NAME: _____

ELECTRIC RATE (EXAMPLE: $0.15/kWh): _____

	UNIT 1	UNIT 2	UNIT 3	UNIT 4
Will the existing motor work with the VFD? (Yes/No)				
EQUIPMENT DESCRIPTION				
Application Type (Fan, Pump, etc.):				
Equipment ID:				
Motor Manufacturer:				
Motor Nameplate HP:				
Motor Nameplate Volts:				
Motor Nameplate Amps:				
Motor Nameplate Power Factor:				
Motor Nameplate Efficiency:				
Is the Existing Motor Inverter Duty Rated (Yes/No):				
Describe the process served by the motor (HVAC, industrial process, machine driving etc.):				
Building Type (Office, Retail, Lodging, Manufacturing, School/College, Health/Hospital, Other):				
Equipment/Area served by fan/pump:				
If fan, note type (centrifugal, axial etc.):				
Is the Fan Forward Curve Type?				
Fan or Pump Manufacturer:				
Fan or Pump Model Number:				
Full Load at Design Conditions (CFM, GPM, RPM):				
(Inches static, Feet of Water, PSI):				
Existing Controls (discharge damper, throttling valve, inlet valve, guide vanes, bypass valve, Eddy current, magnetic drive, etc.):				
MOTOR OPERATING FULL LOAD (PLEASE CHOOSE ONE CALCULATION METHOD)				
Method 1: Measured input power at Operating Full Load (kW):				
Method 2: Measured current and voltage at Operating Full Load: kW = Volts x Amps x PF / Motor Efficiency				
Method 3: Estimated Operating Full Load (Please provide explanation on how load factor has been determined): kW = HP x 0.746 x Load Factor / Motor Efficiency				
VARIABLE FREQUENCY DRIVE INFORMATION				
Make:				
Model Number:				
Line Reactor Make & Model Number:				
VFD Control Strategy (Flow, Pressure, Speed etc.):				
Setpoint (GPM, CFM, RPM, Inches Static, Feet of Water, PSI etc.):				

VFD Energy Savings Calculation Sheet
Worksheet 2

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LOAD PROFILE

For each unit provide characteristic operating conditions (typically 5-6 conditions are sufficient to characterize the fan/pump operation; add separate sheet if more conditions are defined). We recommend that, in order to determine the characteristic operating conditions, data logging (CFM, GPM, Amps, or kWh) be conducted at the minimum over a period of one regular production week. If measured values are not available, provide explanation (on a separate sheet) on how the operating conditions have been determined.

	UNIT 1		UNIT 2		UNIT 3		UNIT 4	
	Hours @ %Load		Hours @ %Load		Hours @ %Load		Hours @ %Load	
?? Hours @ ??% of Operating Full Load								
?? Hours @ ??% of Operating Full Load								
?? Hours @ ??% of Operating Full Load								
?? Hours @ ??% of Operating Full Load								
?? Hours @ ??% of Operating Full Load								
?? Hours @ ??% of Operating Full Load								
Total Annual Operating Hours								
POWER DEMAND	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**
kW Drawn @ ??% of Operating Full Load								
kW Drawn @ ??% of Operating Full Load								
kW Drawn @ ??% of Operating Full Load								
kW Drawn @ ??% of Operating Full Load								
kW Drawn @ ??% of Operating Full Load								
kW Drawn @ ??% of Operating Full Load								
ENERGY USAGE	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**
kWh Used @ ??% of Operating Full Load								
kWh Used @ ??% of Operating Full Load								
kWh Used @ ??% of Operating Full Load								
kWh Used @ ??% of Operating Full Load								
kWh Used @ ??% of Operating Full Load								
kWh Used @ ??% of Operating Full Load								
Total Annual kWh Usage								
COST-EFFECTIVENESS ASSESSMENT								
Annual kWh Savings								
Annual $ Savings								
Implementation Cost								
Simple Payback (years)								

VFD Information Sheet
Worksheet 1

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FACILITY NAME: ABC Manufacturing INC, Lewiston

ELECTRIC RATE (EXAMPLE: $0.15/kWh): 0.10

	UNIT 1	UNIT 2	UNIT 3	UNIT 4
Will the existing motor work with the VFD? (Yes/No)	Yes			
EQUIPMENT DESCRIPTION				
Application Type (Fan, Pump, etc.):	Pump			
Equipment ID:	P-2			
Motor Manufacturer:	Motors Inc.			
Motor Nameplate HP:	40			
Motor Nameplate Volts:	460			
Motor Nameplate Amps:	47.5			
Motor Nameplate Power Factor:	0.95			
Motor Nameplate Efficiency:	93%			
Is the Existing Motor Inverter Duty Rated (Yes/No):	Yes			
Describe the process served by the motor (HVAC, industrial process, machine driving etc.):	Industrial Process			
Building Type (Office, Retail, Lodging, Manufacturing, School/College, Health/ Hospital, Other):	Manufacturing Facility			
Equipment/Area served by fan/pump:	Process Cooling System			
If fan, note type (centrifugal, axial etc.):				
Is the Fan Forward Curve Type?				
Fan or Pump Manufacturer:	Pumps Inc.			
Fan or Pump Model Number:	XYZ123			
Full Load at Design Conditions (CFM, GPM, RPM):	1,200 GPM			
(Inches static, Feet of Water, PSI):	100 Feet H2)			
Existing Controls (discharge damper, throttling valve, inlet valve, guide vanes, bypass valve, Eddy current, magnetic drive, etc.):	Throttling Valve			
MOTOR OPERATING FULL LOAD (PLEASE CHOOSE ONE CALCULATION METHOD)				
Method 1: Measured input power at Operating Full Load (kW):	30			
Method 2: Measured current and voltage at Operating Full Load: kW = Volts x Amps x PF / Motor Efficiency				
Method 3: Estimated Operating Full Load (Please provide explanation on how load factor has been determined): kW = HP x 0.746 x Load Factor / Motor Efficiency				
VARIABLE FREQUENCY DRIVE INFORMATION				
Make:	VFDs Inc.			
Model Number:	VFD_40HP			
Line Reactor Make & Model Number:	LR_3%_40HP			
VFD Control Strategy (Flow, Pressure, Speed etc.):	Pressure			
Setpoint (GPM, CFM, RPM, Inches Static, Feet of Water, PSI etc.):	100 Feet H2O			

VFD Energy Savings Calculation Sheet
Worksheet 2

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LOAD PROFILE

For each unit provide characteristic operating conditions (typically 5-6 conditions are sufficient to characterize the fan/pump operation; add separate sheet if more conditions are defined). We recommend that, in order to determine the characteristic operating conditions, data logging (CFM, GPM, Amps, or kWh) be conducted at the minimum over a period of one regular production week. If measured values are not available, provide explanation (on a separate sheet) on how the operating conditions have been determined.

	UNIT 1		UNIT 2		UNIT 3		UNIT 4	
	Hours @ %Load		Hours @ %Load		Hours @ %Load		Hours @ %Load	
?? Hours @ ??% of Operating Full Load	1,000	100%						
?? Hours @ ??% of Operating Full Load	1,000	80%						
?? Hours @ ??% of Operating Full Load	800	75%						
?? Hours @ ??% of Operating Full Load	800	70%						
?? Hours @ ??% of Operating Full Load	800	65%						
?? Hours @ ??% of Operating Full Load								
Total Annual Operating Hours	4,400							
POWER DEMAND	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**
kW Drawn @ ??% of Operating Full Load	30.0	31.6						
kW Drawn @ ??% of Operating Full Load	28.5	18.9						
kW Drawn @ ??% of Operating Full Load	28.0	16.3						
kW Drawn @ ??% of Operating Full Load	27.4	13.9						
kW Drawn @ ??% of Operating Full Load	26.7	11.7						
kW Drawn @ ??% of Operating Full Load								
ENERGY USAGE	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**	**w/o VFD**	**w/ VFD**
kWh Used @ ??% of Operating Full Load	30,000	31,579						
kWh Used @ ??% of Operating Full Load	28,495	18,902						
kWh Used @ ??% of Operating Full Load	22,365	13,036						
kWh Used @ ??% of Operating Full Load	21,884	11,123						
kWh Used @ ??% of Operating Full Load	21,352	9,380						
kWh Used @ ??% of Operating Full Load								
Total Annual kWh Usage	124,097	84,020						
COST-EFFECTIVENESS ASSESSMENT								
Annual kWh Savings	40,077							
Annual $ Savings	$4,008							
Implementation Cost	$12,500							
Simple Payback (years)	3.1							