APPLICATION EDGE
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TMEIC
We drive industry

INDOOR VERSUS OUTDOOR INSTALLATION METHODS FOR MV VFDS

"A good place to install a medium voltage drive is a place where you can eat, drink and sleep."

VFDs consist of delicate semiconductors, transistors, capacitors, and electronics susceptible to extreme high/low temperatures, moisture, and contaminants. VFD operators control the process, production, labor, raw materials, and other costs in their plant, in addition to the drive's environment. Typical MV drive efficiency ranges from 95.5 – 97%, depending on the power rating. The operator must manage inefficiencies caused by heat generated from the VFD. The following chart shows the heat loss and the associated HVAC tonnage, plus electric charges required to keep a 1000 hp and 3000 hp indoor VFD in operation.

Case: Outdoor Installation (TMdrive-Guardian)		
Carbon Dioxide Equivalent emissions	0.17	tons
Step	**Value**	**Unit**
VFD heat loss to be managed	36.62	kW
Heat conversion on British thermal units	125,009	Btu/hr
Impact on electricity usage		
Aux power required to manage heatloss	0.03	kW
Guardian lost energy (kWh/Month)	20	kWh/month
Guardian losses (kWh/year)	237	kWh/year
Guardian running expense	$16	/year
Predicted yearly electric bill savings	$5,692	/year

Case: Indoor Installation		
Carbon Dioxide Equivalent emissions	58.07	tons
Step	**Value**	**Unit**
VFD heat loss to be managed	36.62	kW
Heat conversion on British thermal units	125,009	Btu/hr
Impact on electricity usage		
Aux power required to manage heatloss	10.42	kW
HVAC lost energy (kWh/Month)	6,844	kWh/month
HVAC losses (kWh/year)	82,131	kWh/year
HVAC running expense	$5,708	/year
Predicted yearly electric bill savings	$0	/year

Figure 1: Heat loss and it impact on electric usage for 1000hp VFD depending on installation treatment. Assume $0.0695/kWhr and running 90% of the time.

Case: Outdoor Installation (TMdrive-Guardian)		
Carbon Dioxide Equivalent emissions	0.17	tons
Step	**Value**	**Unit**
VFD heat loss to be managed	58.31	kW
Heat conversion on British thermal units	199,054	Btu/hr
Impact on electricity usage		
Aux power required to manage heatloss	0.03	kW
Guardian lost energy (kWh/Month)	20	kWh/month
Guardian losses (kWh/year)	237	kWh/year
Guardian running expense	$16	/year
Predicted yearly electric bill savings	$9,073	/year

Case: Indoor Installation		
Carbon Dioxide Equivalent emissions	92.46	tons
Step	**Value**	**Unit**
VFD heat loss to be managed	58.31	kW
Heat conversion on British thermal units	199,054	Btu/hr
Impact on electricity usage		
Aux power required to manage heatloss	16.59	kW
HVAC lost energy (kWh/Month)	10,898	kWh/month
HVAC losses (kWh/year)	130,778	kWh/year
HVAC running expense	$9,089	/year
Predicted yearly electric bill savings	$0	/year

Figure 2: Heat loss and it impact on electric usage for 3000hp VFD depending on installation treatment. Assume $0.0695/kWhr and running 90% of the time.

An experienced practicing engineer will realize that the HVAC required is not insignificant. Applying the classical iceberg principal of the total cost of ownership for an MV VFD, it is very clear that HVAC cooling/heating costs, maintenance and replacement of HVAC's every 7 – 10 years is a significant running cost over the 25 – 30-year lifespan of the MV drive. In an environment where public and private market participants are seriously looking at ways to reduce energy usage and corresponding reductions in Co2 emissions, appropriate selection of installation treatment becomes a critical technical and economic consideration. TMEIC has developed novel thermal management techniques that eliminates the need for a building, HVAC and more importantly "ensures" the drive environment rather than depending on the end user to ensure proper temperature and humidity for the drive. This is a significant departure from conventional methods of MV VFD installation such as an E-house, industrial control building or a site-built motor control center rooms. Contact us to learn more.

For specifications not mentioned here, contact TMEIC

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