F-04	Keywords	Y3	equipment or facility	Z4	electricity	E29	general machinery

Fuji Electric Co., Ltd

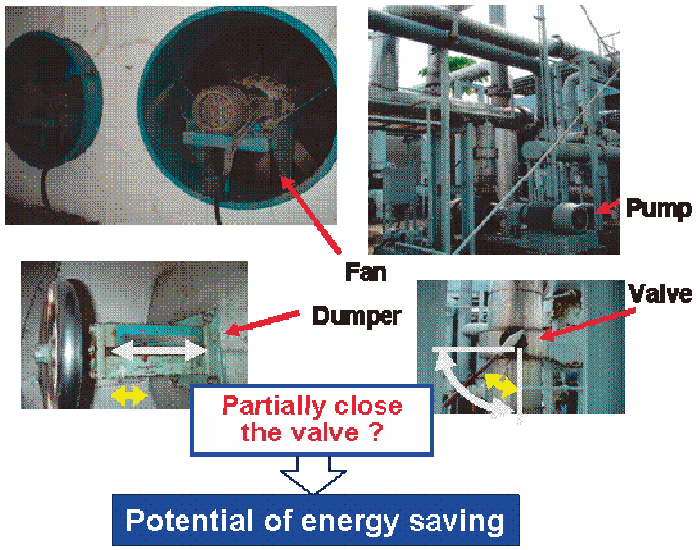
Energy saving due to Medium Voltage Inverter

Features

◆Compact design for space saving
-The industry's smallest-class inverter achieved by significant panel size reduction
◆Ideal inverter for power sources and motors
-The multi-phase diode rectifier system reduces harmonics on the power source side.
-Due to the use of Fuji Electric's unique multi-level PWM control system, the switching surge is reduced and existing motors (standard ones) can be operated.
◆High-efficiency and high-power factor
-The use of a multi-phase diode, full-wave rectifier provides a high-power factor (95% or more) on the power source.
-The elimination of output transformers for operation has improved total efficiency (approx. 97%).
-Fuji Electric's original multi-level PWM control has reduced the IGBT switching loss.

Basic Concept or Summary

The facilities with partially closing valve have waste energy. The energy saving is possible through installation of inverter.



Effects or Remarks

In air-conditioning or pumping facilities, fans or pumps typically run at a constant speed even when the load is light. Adjustable speed control according to the load (air or liquid flow) through inverter operation greatly reduces energy consumption and maintains the maximum possible motor efficiency even at low-speed operation.

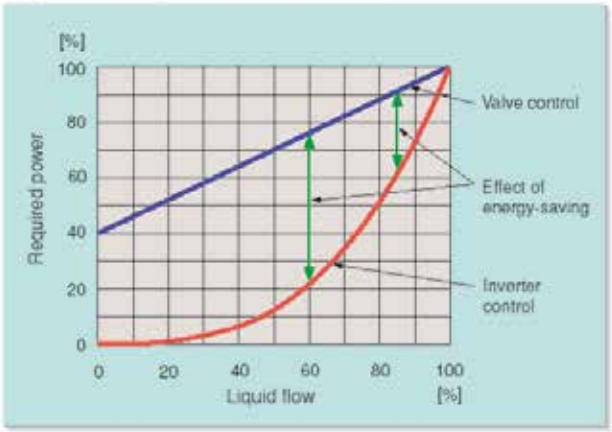
Example of application and energy-saving effect
The following example compares constant speed motor operation with valve (or damper) control, against inverter adjustable speed control operation, and shows the electric power saved.

◆Example conditions for calculation
Motor output:
1,000kW, for annual operation time 4,000 hours
Operation pattern:
85% flow for 1/2 of overall time (2,000 hours)
60% flow for the remaining half (2,000 hours)

◆Constant speed operation of motor
(with valve control)
At 85% load of liquid flow (Q)
Required Power (P) = 91%×1,000kW = 910kW
At 60% load of liquid flow (Q)
Required Power (P) = 76%×1,000kW = 760kW
Annual power consumption
910kW×2,000h + 760kW×2,000h
= 3,340,000kWh

◆Inverter operation (adjustable speed control operation with inverter)
At 85% load of liquid flow (Q)
Required Power (P) = 61%×1,000kW = 610kW
At 60% load of liquid flow (Q)
Required Power (P) = 22%×1,000kW = 220kW
Annual power consumption
610kW×2,000h + 220kW×2,000h = 1,660,000kWh

Liquid flow and power characteristics



◆Annual energy-saving
3,340,000 - 1,660,000 = 1,680,000kWh
(energy-saving = about 50%)
Carbon dioxide reduction = 635,040kg

Installation in Practice or Schedule

◆Steel plant
◆Chemical & Oil plant
◆Cement Plant

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