

DIGITAL FLOW CONTROLLER FOR SMALL HYDRO POWER

Control
Protection
Monitoring



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DIGITAL FLOW CONTROLLER FOR SMALL HYDRO POWER**DESKRIPSI**

Digital Flow Controller (DFC) is a new generation of Micro Hydro controller. DFC is used for controller, protection and monitoring of power plant. DFC is an automatic high level system and also gives safely operation system. Its completed by automatic synchronizer and standard protection as well, and DFC can be connected to web directly with data logger.

Different from the conventional system that are applied from several components such as protection relays, synchronizer, control, signal converter, data recorder and monitor, the performance of new generation of DFC is designed more compact, but also the components can be changed if there is faillure or damage.

DFC is a controller and digital protection with high automation system. The master control is based on the high performance of standard PLC and combined to Filter Module (produced by Renerconsys) so that can be used for small powerplant controller that works parallely or On-grid. And DFC is able to be used for new or present powerplant with flow control or parallel connection system.

Technical Control System spesification.

- Type: DIGITAL FLOW CONTROLLER (DFC-15).
- Rating capacity: 100Kw – 10MW.
- Control method: automatically control to anticipate the changing of load by the set of flow and fly-wheel for maintaining the frequency stability.
- Generator standard protection: Over/under Voltage, Over/under Frequencys, Over current, short circuit, current unbalance, bearing temperature high, stator temperature high dan over speed shut down.
- Grid Standard protection: Over/under Voltage, Over/under Frequencys, Phase unbalance, vector shift.
- Standard meter: 3 Phase Voltage, 3 Phase ampere, frequencys, kVAr, kVA, kW, kWh, operating hours, speed, guide vane position, water level, alarms.
- Controlling Mode: Speed, Frequency, Power, Water Level.
- AVR interface: Voltage control, Cosphi Control, Reactive export.

Master control consist of : Central Processing Unit (CPU), Power Filter Module, HMI, Switches, DC Power Supply. All system is based on microprocessor, all setting parameter, and programs are stored on flash memory IC. The setting will never change. Eventhough the master control based on digital system but it can stand on spike because of completed by filter and surge arrester.

MASTER CONTROL UNIT & FILTER MODULE



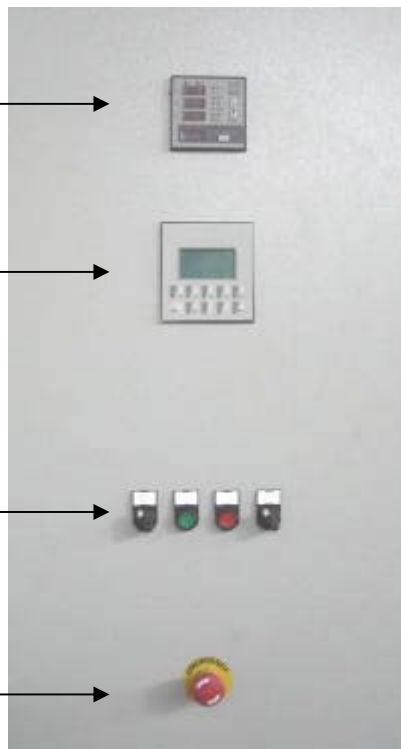
HUMAN MACHINE INTERFACE

DIGITAL POWER METER
V, A, F, Cosphi,
kVA, KW, kVAr,

LCD TERMINAL
Alarms list,
parameter, Electrical
data, Temperature,
Water level, etc

SWITCH & PUSH
BUTTON
ON/OFF, Start, Stop,
Remote

EMERGENCY
BUTTON



TURBINE ACTUATOR

Valve and guide vane are moved by hydraulic. Both valve and guide vane are move from one hydraulic pump unit that driven by electric motor, thus no need connection and turbine spin. Butterfly valve or Guide Vane Actuator are completed by counter weight that possible valve close in emergency condition.



Butterfly Valve Actuator



Turbine Actuator for T-14



Turbine Actuator for francis Turbine



Hydraulic Power Unit

OPERATING SYSTEM

DFC control system is working under fully automatically from valve open until loading process (maintain frequency on load condition). Power supply for black start is supplied from battery.

To operate the powerplant, the operator is only need to push *START* button. Automatically the controller will open butterfly valve until full open position, than open the guide vane until reaches the stable speed turbine on nominal rpm. AVR is activated after the spin turbine is stable. Synchronizing process will be done if grid is on the normal position. When voltage and frequency is equal and the angle of phase is zero, the contactor will be activated. MHP will control according to the active mode (frequency, power or water level control), so does the exiter controller (voltage, cosphi or reactive power control)

When grid is on non-voltage condition (black out), contactor will be activated after confirm by the operator (safety reason) than powerplant receive its load on grid and coinciding with this condition the frequency will be maintained automatically.

The operator is only need to push the *STOP* button to shut off the powerplant, the powerplant automatically will close slowly. When the power is on “off“ position, contactor will released and turbine closed until fully close position.

When there is an interruption and operator cannot handled it, he only need to push the *EMERGENCY* button so that the valve and guide vane will closed automatically, contactor will released so does the excitation. In emergency condition, butterfly valve and turbine guide vane will close automatically eventhough there is no power.

DFC is also completed by alarms and warning, it is usefull to help the operator to detect and handle the interruption or damage. In warning condition (alarms level 1) powerplant is still running. Alarms level 2, powerplant will stop slowly, alarms level 3, powerplant will stop quickly and alarm level 4, powerplant is on emergency condition.

LIST PROJECT DIGITAL FLOW CONTROLLER :



MHP Cikahuripan – Dewata – Ciwidey 2x125kW, Th 2001



PLTMH Melong – Kalijati – Subang 100kW, Th 2004



MHP Santong – Kayangan – NTB, 48kW, Th 2004



MHP Kalibabak – Lantan – NTB, 128kW Th 2006



MHP Cibuni-5 – Ciwidey – PT Melania, 200kW Th 2006



MHP Wanganaji, Wonosobo, 2x70kW, Th 2006



MHP Salido Kecil Unit-2, Painan, 320kW, Th 2006



MHP Banti Wa'a, Tembagapura, 2x128kW, Th 2007