

# PROSAFE AUTOMATION

(AUTHORISED SIEMENS SYSTEM HOUSE)

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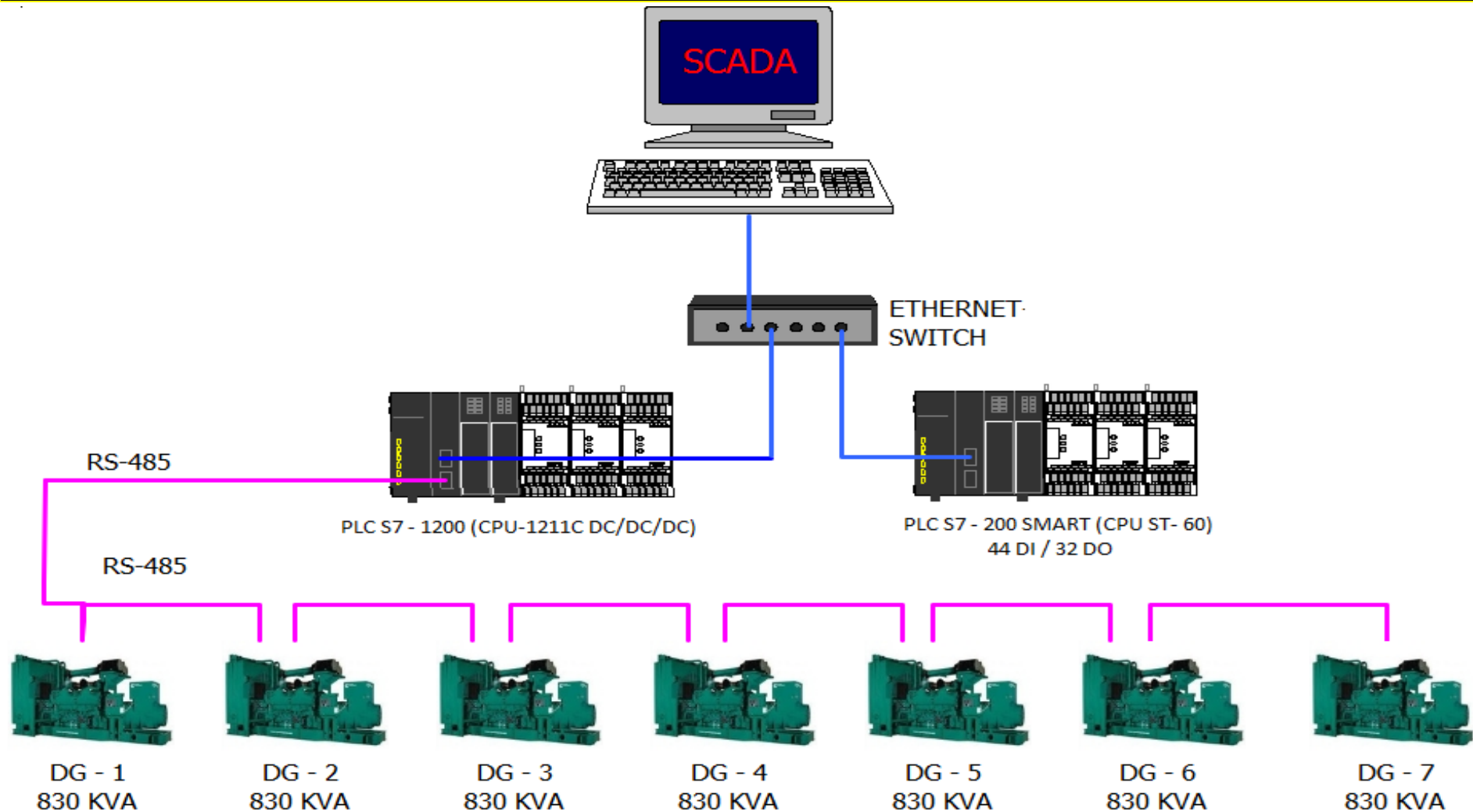
Project Done by :-

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# DG SYNCHRONIZATION & LOAD SHARING & LOAD MANAGEMENT SYSTEM

**Wellknown Polyester ltd Daman**

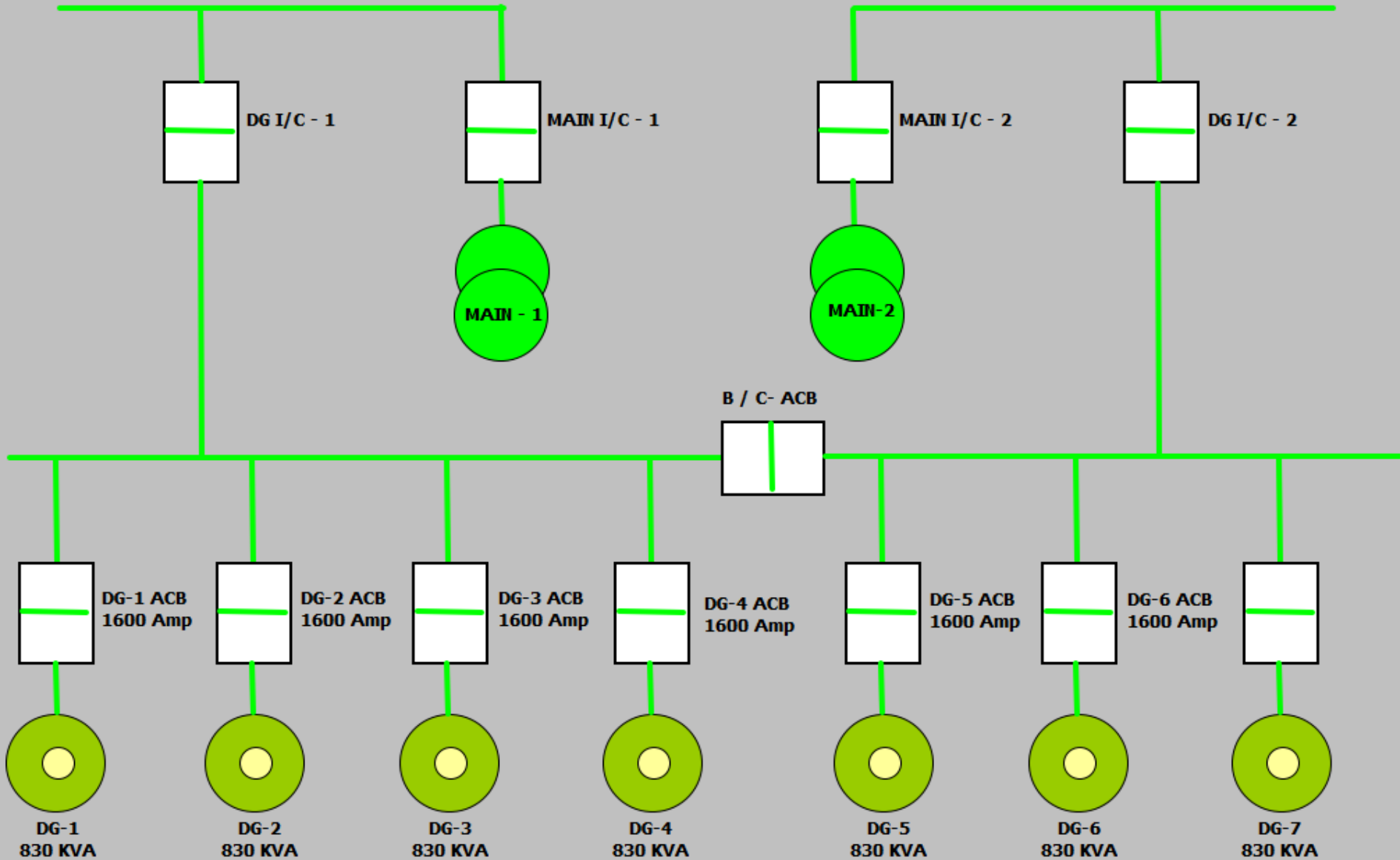


# WORKING PROCESS

PLC system has been designed to provide following salient PLC system has been designed to provide following salient features for DG setsfor DG sets

- *a) Auto Mains Failure (AMF) or Load Management (mains available)*
- *b) Electrical parameter monitoring*
- *c) Auto synchronization*
- *c) Auto Load Sharing*
- *d) Load Management System*
- *e) Protection*

# SIGNAL LINE DIAGRAM



# PROGRAMMING FEATURE FOR DG SETS

## ***Auto Mains Failure (AMF) or Load Management***

The system will come in operation after sensing of Grid Failure. The initiation of DG operation can be done in AUTO / MANUAL mode from Man-Machine-Interface to automatically control the start & stop of engines, depending on the predefined load & DG selection in the PLC.

In case DG engines do not start in the first cranking, two or more auto commands should be given with proper intervals. Even that if engine fails to start indication will appear on Man-Machine-Interface.

At the time of power failure PLC will start engines as per LOAD requirement i.e. Running load is sufficient only for one engine when PLC will start only Master DG & in another case if Load requirement is for Three DG sets, PLC will start Master, Second & Third engine as per selection.

PLC will sense the Load running on Transformer in every 3 seconds to start the No. of DG sets as per the Load requirement.

In the case of Load management during “Power Available”. If Load exceeds more than the capacity of the Transformer then PLC will start Master Engine and close the breaker for the same engine, or, as per Load requirement if two or more engines required. In this case Bus Coupler will be in open Position as per requirement of Single Line Diagram.

# PROGRAMMING FEATURE FOR DG SETS

## ***Auto Synchronization***

The facility of synchronization will be available in Auto mode. In normal circumstances the auto synchronization will work, however due to any reason auto synchronization fails, PLC will generate an audio visual alarm and initiate start command to next generator ready for operation. Before synchronization PLC system will monitor & control DG parameters like voltage, frequency & phase angle difference and when the parameters of main bus & DG will be in defined range, PLC system will connect the output of DG to main bus.

## ***Auto Load Sharing***

Sensing both active & reactive power will perform auto load sharing. The percentage loading of a particular DG will be fed by MMI. This feature is important when synchronization is done between new and old, or between DG's of different ratings. New DG is normally has high loading factor than a old DG. PLC will allow only predefined loading to all the DG's

## ***Load Management System***

Load management system is designed for auto start/ stop for the slave DG sets as per the load requirement i.e. in case of running DG sets being over load (more than 80%) then PLC will start the next DG sets after a pre-defined time delay. After starting the DG set PLC will take care the synchronization and proper load sharing as per DG rating. In case running DG sets being under load (less than 60%) then PLC will stop the one DG set after transferring the load on another running DG sets.

## ***Inbuilt Auto Safety Protection***

The proposed system also provide protection as external relays gives for Reverse Power, Reverse KVAR, Over Current, Under Voltage, Over Voltage, Under Frequency, Over



# SYSTEM FEATURES

The system is designed run in AUTO as well as in MANUAL mode. In auto mode the system will run automatically with predefined sequence and in manual mode all the operation will be done as per the sequence will be defined by operator.

- ☐ DG's will be started & stopped automatically as per the load requirement on the main bus.

- ☐ Selection of DG's for DG start stop automatically on sudden load requirement.

- ☐ Automatic synchronization of DG sets in Auto mode

- ☐ Active & reactive Load sharing of each DG set

- ☐ Automatic selection of Next DG as master after stopping / tripping of master DG to close NGR circuit.

- ☐ Monitoring of electrical parameter of each DG, voltage, frequency, reactive load, active load, energy produced, voltage error (%), frequency error and phase angle error etc.

- ☐ Status & control of outgoing breakers

- ☐ Back up protection electrical / mechanical by time delayed tripping of Dg sets.

- ☐ Reverse power; reverse KVAR, under voltage, over voltage, under frequency, over frequency, over current, low lube of oil pressure, high cooling water pump, over speed etc.



# SYSTEM FEATURES

- ☐ Data acquisition system will be incorporated with the system for the purpose of recording & display of all important & critical parameters of the engine, alternator & system as such in totality. Operation of the system will also be through operator interface with graphics screen into PC Pentium computer.
- ☐ “B” checks alarm after each DG complete 300 hours of running for proper maintenance.
- ☐ Tripping of non-critical loads in the plant in case of under frequency of bus both in isolation as well as synchronized mode.
- ☐ Control of all auxiliary drive of DG sets will start stop automatically with proper interlocks as per safety considerations.
- ☐ PLC system will have provision to test the DG in auto mode without closing the breaker to do the routine electrical / mechanical testing of DG sets without interruption of power generation.

## ***Master DG***

PLC system will monitor the Grid Failure signal through under voltage relay. As soon as GRID supply fails, PLC will start master DG set and after getting the proper voltage and frequency, PLC will close the first neutral contactor and then DG incomer MCCB automatically after ensuring the T/F ACB is in trip condition.

When GRID supply gets restored PLC will issue an audio-visual alarm after a pre-defined time delay to operator attention. Change over will be done automatically by PLC with proper interlock i.e. PLC will first trip the DG sets incomer ACB/ MCCB then transformer ACB shall be switched-on automatically.

# SYSTEM FEATURES

## ***Slave DG:***

Slave DG, start/ stop will be done as per Load Management system. After starting the slave DG set, PLC will compare the Voltage, Frequency and Phase angle between Synchronizing bus & reference bus. After matching these parameters PLC will close the slave DG ACB/ MCCB automatically. Load sharing will be also done by PLC automatically.

## ***Load Management System:***

If Single DG is running on load and total load is more than 80% of running DG then PLC will start the 2nd DG after a pre-defined time delay. Synchronization and load sharing shall be done by PLC automatically.

If two DG`s are running on load and total load is more than 80% of running DG`s then PLC will start the 3rd DG set after a pre-defined time delay. Synchronization and load sharing shall be done by PLC automatically.

If N DG set are running on load and total load is less than 70% of N-1 DG set then PLC will trip the ACB/MCCB of last DG automatically after a pre-defined time delay. Engine will stop after 3 minutes idle running in auto mode.

Above process shall continue while running the system in auto mode to achieve the maximum efficiency of DG set.

# SCADA SCREEN

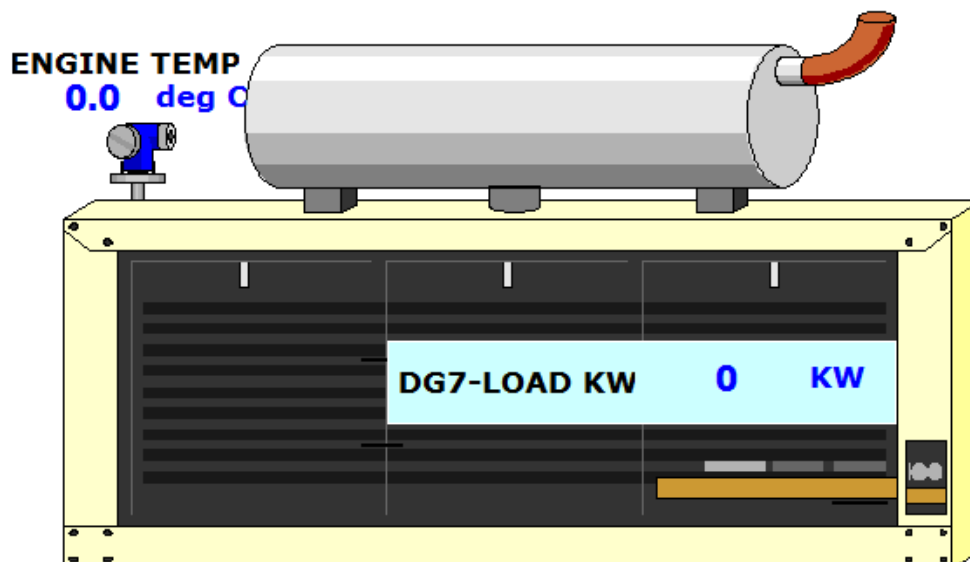
WELLKNOWN POLYESTER LTD. DAMAN  
7X830/900 KVA DG SET





Time : 2:45:53 PM  
dd/mm/yyyy12/26/2016

## DG7-ALTERNATOR PARAMETERS

Tag Discription	Process value
Voltage-L1 L2	0 V
Voltage-L2-L3	0 V
Voltage-L3-L1	0 V
CURRENT L1	0 A
CURRENT L2	0 A
CURRENT L3	0 A
GEN. FREQUENC'	0.0 Hz
LOAD Kw L1	+0 Kw
LOAD Kw L2	+0 Kw
LOAD Kw L3	+0 Kw
LOAD Kva	+0
LOAD KVAr	0.00
LOAD kWh	0
LOAD kVArh	0
LOAD PF	0.00

## DG7-ENGINE PARAMETER



	0	Oil Presure-KPaI
	0.0	Battery Voltage-Volts
	0	Speed-RPM
	0.0	Coolent Temp deg C

# SCADA SCREEN

## ALL DG SEQUENCE

DG 1 SEQUENCE

DG 2 SEQUENCE

DG 3 SEQUENCE

DG 4 SEQUENCE

DG 5 SEQUENCE

DG 6 SEQUENCE

DG 7 SEQUENCE

## SWITCH STATUS

MAIN IC/1



DG IC/1



UTILITY 1 SEL.



BUS 1 SEL



MAIN IC/2



DG IC/2



UTILITY 2 SEL.



BUS 2 SEL



SYNCH OK



**BUS OVERLOAD AT**

0

%

**AFTER TIME**

0

Sec.

**BUS UNDERLOAD AT**

0

%

**AFTER TIME**

0

Sec.

LMS MANUAL

ACTUAL DG LOAD

0

KW

NEXT DG START AT

0

KW

PREV. DG STOP AT

0

KW



SLD

DG1

DG2

DG3

DG4

DG5

DG6

DG7

GENERATOR  
SEQ  
CONTROL

DG  
-  
PARAMETER

Reset



EXIT  
→

# SCADA SCREEN

## ALARM PAGE

Time	Date	Sta...	Text	DG
------	------	--------	------	----



SLD

DG1

DG2

DG3

DG4

DG5

DG6

DG7

GENERATOR  
SEQ  
CONTROL

DG  
-  
PARAMETER

Reset



A sunset scene with a bright sun low on the horizon, casting a warm glow. Silhouettes of tall grasses are visible in the foreground.

THANK YOU

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