

Ethernet

Siemens fieldbus

GE fieldbus

Level 2

EWS

OWS

OPC

Historian

Emerson fieldbus

Supervisory

Hard-wired

Control

Level 1

PLC

DCS

PLC

Process

DCS

Control

(Emerson Ovation)

(Siemens S7-1500)

(GE Mark VIe)

(Siemens S7-300)

Remote I/O Rack

Remote I/O Rack

Level 0

subnet 1

subnet 2

subnet 3

Field Devices

Boiler

Turbine

Water-Treatment

HIL Simulation

Process

Process

Process

FIGURE 2. TESTBED COMPONENTS AND DATA FLOW.

BOILER PROCESS CONTROL

Emerson Ovation DCS consists of four feedback control loops to control the pressure, water level, outflow, temperature, and cooling pump.

Pressure

P1-CC

P1-FC

demand

P1-LC

P4-STM

Temperature

demand

P1-PC

P1-TC

TWIT

LIT

LSH

04

01

03

SOL02

HT01

TIT

PWIT

02

03

LSH

02

FT

PIT

02

02

TK03

FT

Return Water Tank

01

FCV02

LSL

TK02

02

LCV01

Heating Water

FCV01

Tank

FT

C

03

FCV03

PP02

PIT

TIT

01

01

Cooler

SOL01

PCV01

Heat

TWIT

LSL

LSH

TWIT

LSL

LSH

05

04

04

03

01

01

Exchanger

PCV02

PP01A

TK04

PP04

TK01

Buffer Water

SOL04

Main Water Tank

PP01B

SOL03

Tank

FIGURE 3. BOILER PROCESS CONTROL ARCHITECTURE.

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