Remote Monitoring of Pump sets, Surge Vessel Level and Robert Shaw Panel: Agbada 2 FS

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Preliminary project scope statement for revamp and modify the field instrumentation in Agbada 2 Pump house for remote pumps and surge vessel signal output monitoring at the Agbada AGG control DCS

End User: SPDC Agbada. Service Provider: SPDC Nigeria.

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1.0 Business Case

The Agbada 2FS provides the associated gas for the compression station AGG. It solely relies on the availability of crude oil export pumps otherwise there is no delivery to export line hence no production. The pumps are under speed control from the surge vessel level it is possible to have the plant trip on the following causes:

High level in surge resulting from a pump failure;

High level in the surge vessel resulting from failed level controller

High level in the separators resulting from failed level control system

It is not uncommon to have 9 out of every trips result from high level. During the day field operations round help in early detection and intervention. It has been observed that intervention at night is belated resulting to loss of barrels up to 2000bbls each time it happens.

Because the flow station may trip at night when operators round is infrequent, it becomes economical to have the adjacent AGG control room operator does the monitoring in addition to monitoring the AGG from the DCS thus arrest imminent trip.

This project does not seek to place the entire flow station on remote monitoring as that is a major PACO project. Rather it seeks to utilize already installed hardware sensors which can provide pump and surge vessel level remote monitoring but were never fully commissioned, to provide early detection for intervention on pump outages and surge vessel level excursion to trip limits.

2.0 Project Objectives.

To revamp and modify the field instrumentation in Agbada 2 Pump house for remote pumps and

surge vessel signal output monitoring at the Agbada AGG control DCS

3.0 Project Requirements

Control room operators will be able to identify which crude oil export pump is running and which is stopped

1) Control room operators will be able to see the speed in RPM of any running crude oil export pump
2) Control room operators will be able to read the surge vessel signal output in PSI and in percentage
3) Control room operators will be get alarms for low pump speed, high pump speed and a TRIP alert for a pump and drops
4) Control room operators will be able to see the Robert Shaw Panel alarms and be able to trend the history for any particular alarm.
5) The project shall not include the construction or revamp of any instrumentation on the separators, FLKO or surge vessel

4.0 Cost Savings

The cost of performing a similar project by Asset Engineering was placed at USD20,000. This is the amount that would be saved by the team doing the project at less than NGN2m or USD9400

5.0 Project Assumption

The human resources for the implementation of this project are in the table

Name	Role	Responsibility
Dan-Nwaogu Arthur (SPDC-UPO/G/PLR)	Asset PACO Team Member	Collaborate to develop all necessary instrument documents and oversea the project delivery which includes field and DCS modifications.
Eyo Etim SPDC- UPO/G/PLR	Asset mechanical Supervisor	Collaborate to develop all mechanical drawings and material specification and oversea the laying of pipe conduits as well as the hook up

		of the engine speed sensor on the pump skid
Ikenna Oranye SPDC-UPO/G/PSMD	PACO Technical Authority	Review of the technical changes to ensure professional work quality for reliability and safety.
Nwoke Sunny SPDC-UPO/G/PLR	Asset Operations Team	Provide advice for the operability, facilitate PTW, and Initiate the Management of Change.
	Asset Team Document Controller	Provide access to all the useful project documents and facilitate secondary changes at the close out stage of the project

5.1 Budget Support

 The budget approval process to be followed is the Commitment Control Panel review of cost and funded from Asset OPEX.

5.2 Material source

Materials shall be sourced from the ware house and open market where it is not possible from within SPDC.

Existing speed sensors used for local display on the engines shall be used also for the remote monitoring, Connection shall be such that removal of either the local speed indicator or the remote connection shall not impair the function of the other.

The existing pressure transmitter will be used for the surge vessel output signal

Existing Device Signal Tags and graphics will be used for the pump speed RPM and the surge vessel output with minor changes to

The table below shows the materials requirements

Material	Qty Needed	Unit Price(NGN)	Total Price

2-core, Twisted pair shielded armoured , blue outer covering, instrument cable; core 1.5mm2	145feet	2000	290,000
Ex- Junc box, 4inch diameter wide, two ½" NPT cable entry, with a threaded cover.	10pcs	9500	95,000
Cable gland, ½" NPT	25pcs	5500	137,500
Ex- Junc box, 4inch diameter wide, THREE ½" NPT cable entry, with a threaded cover.	7pcs	12000	84,000
Shrouds for ½" glands	25pcs	1200	30,000
16AWG stranded wires red insulation	15meters	5000	75,000
16 AWG copper stranded wires, black insulation	15 meters	5000	75,000
Pipe, galvanised, 1" dia, pressure class 150PSI	60feet	5000/6m	16,500
1" pipe Union, galvanised	14pcs	4000	56,000
1" pipe elbow, 90degree, glavanised	14pcs	4000	56,000
1" T Pipe connector , 90degree, FNPT	14pcs	4000	56,000
½"NPTX1/2" O.D TUB Connector, Straight	7pcs	3500	24,500
½"NPT X 3/8"FNPT Reducer	7pcs	3500	24,000
2"x2" angle iron	14feet	5500/6m	5500
U –bolts and washers, lock nuts for clamping a 1" pipe to angle iron	14pcs	1000	14,000
Terminal block 6 points	2	10000	20,000
Pipe cutting and threading		50000	50,000
Skid top clamp preparation	7pcs	25000	175,000
Cement	2 bags	3000	6,000
TOTAL			**1,290,000**

MATERIALS	QTY NEEDED	UNIT PRICE	TOTAL
Pressure-Voltage transducers; SAP 1000370191	15pcs	$100	$1500

5.3 Project Execution Time

No activity shall require plant shutdown. The construction of conduit pipe clamps shall be completed in a remote workshop with all mounting holes drilled, only to be installed on the pump skids.

6.0 Project Constraints

The delay in material delivery

Management approval for budge, note this is a cost saving venture by asset team that would save the company good money.

7.0 Project Risks

There are no associated risk to performing this task. No shutdown of facility or pump-set is required for any of the activities such as laying of cable or hook up of the speed sensors for remote monitoring. All hot work will be done outside the facility such as preparation of the clamp for the cable conduit pipes.

8.0 Project Work Method

Task Steps	Task Brief	Task Description.
1	Specification and quote for materials and services requirement	Identify the materials required and activities that would be done; and or shutdown requirements.
2	Secure BFM approval	Commitment of leadership
3	Securing MOC approval	Require MOC to tie the surge vessel level output transmitter to the DCS PAS,

		MOC to make graphic appearance changes on DCS for surge vessel level output MOC for alarm rationalisation for pump speeds and Surge vessel level Low/High
4	Procurement of materials and delivery to site	
5	Laying of cables for the surge vessel transmitter and hook up	Laying of cable for the existing pressure transmitter to the JB
6	Wiring the marshalling cabinet (Agbada 2 fs DeltaV PAS)	Completing the wiring for I/Os
7	Laying of pipes and anchoring to pump skid for EP1 through EP7	Clamps are to be prepared outside the facility and no drilling on the pump skid is required.
8	Cable laying and termination to pump speed sensors	Use of explosion proof wiring junction boxes
9	Revamp of the Robert Shaw Panel Remote monitoring instrumentation	Loop check and replacement of faulty P/E converters
10	DCS graphics and alarm rationalisation	Colour changes, and possible alarm rationalisation be noted for next Alarm rationalisation review.

9.0 <u>Project Deliverables</u>

This is presented as an Engineering Project Requirement

The table below translates the Operations Requirement into testable Engineering Requirement Specifications

EPR Reference Number	Operations Requirement	Engineering Requirement Specifications
001	Control room operators will be able to identify which crude oil export pump is running and which is stopped	Modification of the display graphics to include "RUNNNING" and "STOPPED"
002	Control room operators will be able to see the speed in RPM of any running crude oil export pump	Reconfiguration of the PI function block to display exact pump speed in RPM on the Export pumps graphics. Hook up of the remote monitoring circuit to the same speed sensor used for local speed display.
003	Control room operators will be able to read the surge vessel signal output in PSI and in percentage	Surge Vessel output pressure transmitter to be replaced Cables to be laid to hook up transmitter to the DeltaV Marshalling Cabinet
004	Control room operators will be get alarms for low pump speed, high pump speed and a TRIP alert for a pump and drops	Alarm rationalisation for low Speed and High speed to be rationalised as critical with historical collection enabled.

Program conditional alarm to signify a "TRIP" in order to differentiate from a "STOPPED" |
| 005 | Control room operators will be able to see the Robert Shaw Panel alarms and be able to trend the history for any particular alarm. | All faulty P/E sensors in the Robert Shaw Panel will be replaced.

Alarm rationalisation on Robert Shaw trip alarms as ALERT. |
| 006 | Construction and laying of cable and conduit shall in no way cause obstruction or constraint to normal operations and maintenance. | Cables to run through a pipe conduit on the pump skid and on cable trays off the skid

All pipe conduit shall be gripped to the skid using clamps at two ends. A JB will be used for termination of local display and remote |

		monitoring wires to the single sensor