Eskom	Scope of Work	Kusile Power Station

Title: **Kusile Power Station Fire Pump Diesel Engine Governor Valve Controller Modification Scope of Work**

Document Identifier: **KUS-20220567**

Alternative Reference Number: **N/A**

Area of Applicability: **Kusile Power Station**

Functional Area: **Engineering**

Revision: **1**

Total Pages: **9**

Next Review Date: **N/A**

Disclosure Classification: **Controlled Disclosure**

Compiled by	Supported by	Functional Responsibility	Authorized by
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Date: 2022/05/24	Date: 2022/08/10	Date: 2022/08/11	Date: 2022.08.11

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1. Introduction

Two 50 percent capacity ASIB approved diesel engine driven fire water pumps provide backup in case of an electrical power failure. Double walled fuel tanks, the fuel system, batteries, and other required accessories, including ASIB approved pump control panels are provided.

The pumps are horizontally split-casing centrifugal pumps.

These pumps are designed to deliver 750m³/hr at 1.0 MPa pressure. Each pump discharge is fitted with a pressure relief valve. The pressure relief valves are designed to open at 1.4 MPa in order to protect the system from over pressurization**.**

A suitably qualified Contractor is required to implement the Fire Pump Diesel Engine Governor Valve Controller modification which will include the following:

- Conversion of the manual governor valve to an automatic (electronic) governor valve controller

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to details the scope of works required for the Fire Pump Diesel Engine Governor Valve Controller modification.

2.1.2 Applicability

This document applies to two Doosan Diesel Engines at Kusile Power Station only.

2.1.3 Effective date

This document will be effective from the date of its authorisation.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] 240-147927507 Kusile Power Station Fire Pump Performance Test Report Rev.1

[2] 240-136726203 Kusile Power Station Annual Main Fire Pump Performance Test

[3] 0.90/942 (146838-0SGA-M2665C) rev6 – Fire Pump House P&ID

[4] 240-54937454 Inspection, testing and Maintenance of Fire Protection Systems Standard

[5] ENG/PP/12: Centrifugal Pump Performance Calculations

[6] 240-160545947 Kusile Power Station Engineering Change Root Cause Analysis/ Investigation/ Assessment for conversion from manual to auto governor valve for diesel fire pumps Report

2.2.2 Informative

[1] NFPA 20 Standard for the installation of stationary pumps for the fire protection 2003

[2] SANS 10287 Automatic sprinkler installations for fire-fighting purposes

[3] 36-681 - Eskom Plant Safety Regulations

[4] 950106-036009EN Doosan Engine manual

2.3 Definitions

Definition	Description
Contractor	Service provider contracted to provide a specific service to Eskom, Kusile Power Station.
Employer	Eskom, Eskom Kusile Power Station or representative

2.4 Abbreviations

Abbreviation	Explanation
ECSA	Engineering Council of South Africa
QCP	Quality Control Procedure
ITP	Inspection, Testing Plan

2.5 Roles and Responsibilities

2.5.1 Contractor

a) Executes the defined scope according to contractual agreements

b) Submits all relevant and necessary documentation requested by the Employer once works are completed

2.5.2 Employer

a) Review and approves the Contractor's Quality Control Procedure (QCP) and Inspection, Testing Plan (ITP)

b) Is present for all applicable points of the ITP

2.6 Process for Monitoring

This works will be monitored through the approved QCP and ITP.

2.7 Related/Supporting Documents

[1] 240-161545675 - Kusile Power Station Evaluation Report for equivalency change on diesel fire engines conversion from manual governor to original electronic governor speed control system

3. Fire Pump Diesel Engine Governor Controller Modification

3.1 Plant Description

3.1.1 Fire Pump Diesel Engine Governor Controller Layout

The Fire Pumps Diesel Engines (2-off) are located at the fire pump house behind the Water Treatment Plant building. A modification is required to restore the original electronic governor speed control system to its original design. The operating and maintenance manuals refer to the electronic governor for set up and not the manual governor as installed on the plant.

By definition as per the OEM manual, the governor detects the engine rpm using a magnetic pick-up sensor to adjust the flow rate of the injection pump and maintain the desired rpm. The governor detects the engine speed, compares it with the set speed and sends out an output signal to open or close the fuel injection pump accordingly until the actual speed reaches the set speed.

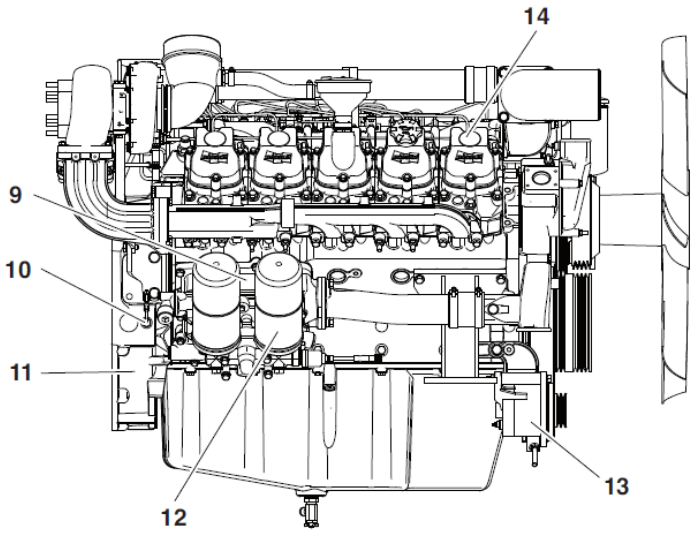

Figure 1: Doosan Diesel Engine layout

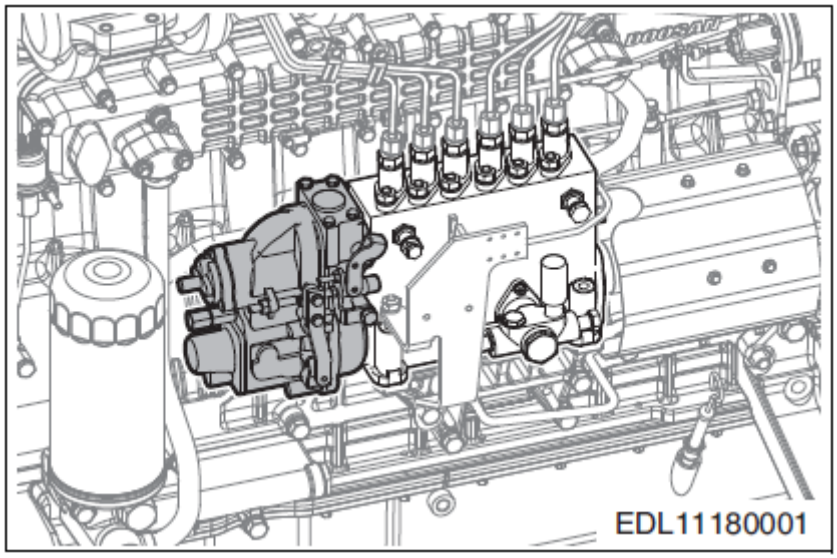

Figure 2: Doosan Diesel Engine Governor Controller Typical Installation

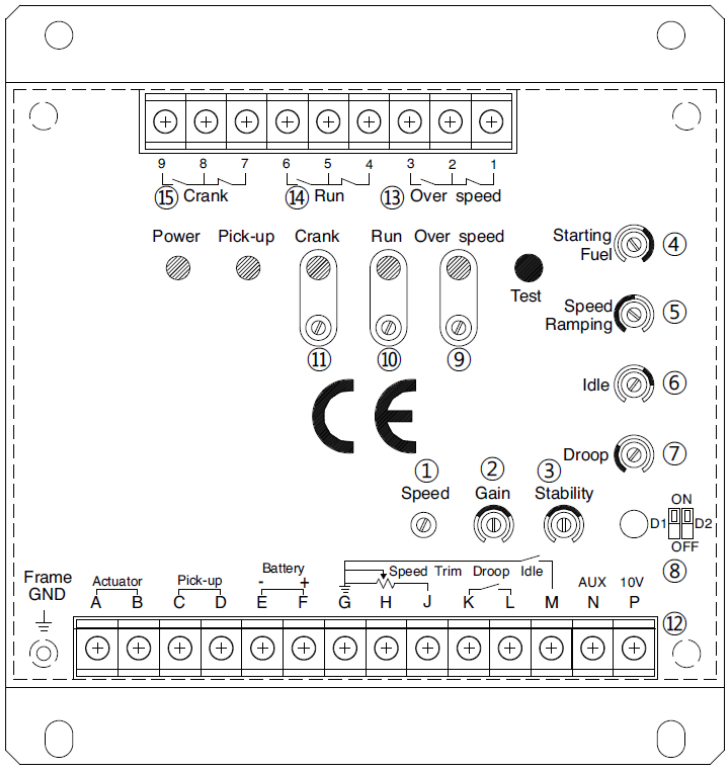

Figure 3: Doosan Diesel Engine Governor Electronic Controller Unit

3.1.2 Diesel Engine Governor Controller Operating Principle

In this system, when adjusting the engine output, the controller is adjusted to set and activate the IDLE and RUN RPM, while the electronic governor is operated to adjust the injection pump and engine output.

3.2 Scope of Work

3.2.1 Diesel Engine Governor Electronic Controller

A suitable and compatible electronic controller type is to be used for this specific engine. This includes all associated wiring and mountings.

The electronic governor controller unit is to be mounted as per OEM manual, with special consideration to avoid exposure to radiant heat and moisture content to prevent damage to the controller. For overspeed protection, A secondary shutoff device, such as a fuel solenoid must be used.

EMC (Electromagnetic Compatibility) requirements must be satisfied; this includes the use of shielded wires for all signal lines and ground all the shields to one of the bolts used to mount the controller.

The Contractor will be required to provide the equipment needed to install and commission the governor. The Contractor must carry out the applicable functional tests and safety tests. Once commissioned, the Contractor will be required to conduct pump performance test to verify that the installation can achieve the desired intent of maintaining the engine speed at varying loads.

Supplier will provide values for power consumption during starting of the engine. This might also relate to the currently installed charger, if capacity of this charger will be enough to maintain the required voltage on the batteries, should additional batteries be required.

Based on the electronic governor manuals, it is not clear if there will be an impact on the electrical control panel, re-wiring or reconfigurations inside the panel or no additional requirement on the ac power supply to the panel thus far. Wiring will be done from the batteries to the diesel generator side. Also, this can be confirmed during the detailed design phase.

During the installation of the new electronic governor, one of the diesel engines will not be available and will be impaired.

3.3 Testing Requirements and Procedures

Confirmation of the work done by the Contractor, by the Employer, is crucial and must be included in the Contractor’s Quality Control Procedures (QCP) and Inspection Test Plans (ITP).

The Contractor must submit the following:

a) Proposed methodology to the Employer for review. This will include all QCP and ITP.

b) The Contractor must submit WPS and PQR for all welding activities related to this scope for approval.

c) All signed off procedures, QCP and ITP must be submitted to the Employer on completion of the works

3.4 Performance Guarantees

The Contractor guarantees that the Equipment are completely new and superior in quality, free from any defect in design, material and workmanship, suitable for the use and purpose.

The Contractor provides warranty against any defects for the supplied components.

The contractor guarantees that the supplied equipment will meet the requirements as stated in this scope of work document to improve the overall performance of the diesel engine.

3.5 Documentation

The Contractor is required to compile and submit a data package for the completed works. The data package must include – this must contain all documentation used and prepared for the works i.e.

a) Data sheets
b) Test results/certificates
c) Signed QCP and ITP
d) Operating and maintenance manuals

4. Acceptance

This document has been seen and accepted by:

Name	Designation/Department
Lawrance Mabiletsa	Turbine Engineering Manager
Lebogang Mabuza	Turbine Engineering
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Thabani Shibe	Electrical System Engineer(Essential System)

5. Revisions

Date	Rev.	Compiler	Remarks
March 2022	1	M Gomomo	First issue

6. Development Team

The following people were involved in the development of this document:

- M Gomomo

7. Acknowledgements

- Project stakeholders