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Optimization of Offshore Electric Power System Operation for Increasing Total Power Ratio: Lima Offshore Case

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Abstract. Optimization of electric power system operation in oil-gas offshore is one of important research themes, because the use of power energy in a platform is significant and needed to be increased. The number of researches regarding theoretical aspect has been published. In this paper, a practical approach of optimal power system operation in an offshore platform is provided. PT Pertamina Offshore platform called "Lima" offshore is taken into consideration. Lima Offshore has 2 platforms namely "Service" and "Kompresor" platform. The service platform capacity has overloaded until 133.84%. However, compressor platform has served a load only 50.88%. Hence the platform should be optimized. Generally, offshore platforms have limitations in adding of new power plants. Based on this constraint, it is necessary to optimize the operation of several power plants. The result of this research that two power plants can be parallelized, the total power capacity produced becomes 1750 kW and the total loads that must be served of 98.28%. To parallelize 2 platforms, must be known the capacity of power bus to handle a short circuit current. By short-circuit current calculating can be found that the maximum value current, the power bus bar 50 kA symmetrical and power bus bar 25kA symmetrical branches. To avoid total loss of power supply when one or two generators down, have used the load shedding system, to ensure there is no interruption in the operation of the system.

Keywords: Optimization, Power Loss, Load Shedding, Fault Current, Offshore Platform

I. Introduction

This Oil rig consists of four platforms, namely service platforms, well platforms, process platforms and compressor platforms [1][2].In the service platform, this electrical energy is used to drive electric motors driving water pumps, oil pumps, air compressors for wind power control, freshwater making machines, air conditioners, lighting lamps and electricity for residential facilities. In the compressor platform, most of the electrical energy is used for auxiliary motors in gas compressor turbines, including cooling fans, lubricating oil pumps, engine starters, fuel pumps, and battery chargers.With the increasing processing and shipping of oil and natural gas, the electricity power needed is also increasing.The existing power generation system must meet the needs of this electrical energy [1].The problem is how the addition of new electricity loads can be overcome with the existing plants on the bridge, without the newinstallation plants [5][11].To supply electric power of platform can be parallelized two or more generators to increase the generated power to meet energy needs. The attempt to parallel this, must meet the requirements, namely: Voltage and Frequency of both generators must be the same as the bus, the phase difference and the both phase sequence of the generator must also be the same.To obtain the same voltage, automatic equipment AVR (Automatic Voltage Regulator) is needed to maintain the voltage stability of the generator [4].When conditions are paralleling the generator, if there is a voltage difference the generator with a lower voltage will be damaged [6].

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