Automatic Floodlight Control (Autofcon) on *Apron Floodlight* (Case Study of Class III UPBU Namrole Airport)

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Abstract
This study aiming for design and implement Automatic Floodlight Control (AUTOFCON) system on the Floodlight apron at Class III UPBU Namrole Airport. The system This developed for increase efficiency operational and addressing limitations manual control on Floodlight lamps, especially moment Evening day or in condition weather bad. AUTOFCON uses a Photocell sensor for detect intensity light environment. This System Work in a way automatic with turn on light when light environment dim and turn it off when light sufficient. Research methods covers stage design device hard, installation components, and testing system. Test results show that AUTOFCON is capable functioning with response fast and accurate to change intensity light. This System increase efficiency energy with optimize use Floodlight only moment needed. In addition, the system also reduces risk disturbance operational consequence delay or manual errors. Obstacles found, such as potential Photocell sensor error consequence dust or weather extreme, can overcome through routine maintenance. Conclusion from this study is AUTOFCON provides solution innovative for lighting automatically on the Floodlight apron, with benefit in the form of efficiency operational, savings energy, and increase security. This System can become a model adopted by other airports to support operational more flights effective and efficient.

Keywords: Automatic Floodlight Control, Apron Floodlight, Photocell Sensor, Energy Efficiency, UPBU Namrole Airport.

Introduction

Progress in various field life humans are very fast along with development technology. This is cause man always want to innovate for create a technology that makes things easier in do activity in a way effective and efficient (Aryza et al., 2020). Changes in the Industrial Revolution 4.0 Era encourage various sector for Keep going develop towards a better future good, modern and integrated digitally. Development technology covers various aspects, including infrastructure transportation, which becomes element important in progress a country. As an archipelagic country with more of the 17,000 islands spread out from Sabang to Merauke, Indonesia is facing challenge big in connect each region for support equalization development and growth economy. One of the the most efficient solution in overcome challenge geographical This is a transportation air, which allows efficiency time and support activity economy interregional (Suharyadi et al., 2020).

Airport, or otherwise known as airport, plays a role important as center transportation air, place aircraft off takeoff and landing. In addition to the runway, the airport is also equipped with with facility additional support activity operational, good for both operators and user service flight. One of the facility main at the airport is system lighting field Airfield Lighting System (ALS), which includes Floodlight, Precision Approach Path Indicator (PAPI), Wind

Cone, and Runway Threshold Indicator Light (RTIL). At Class III Manrope UPBU Airport, one of the facility lighting important is the Floodlight Apron, which works for give lighting in the parking area aircraft.

However, the operation of the Apron Floodlight at Class III UPBU Manrope Airport moment still done manually. This is cause a number of risks, such as delay in give lighting during activities on the apron, especially at night day or moment weather bad. This Condition can bother smoothness operational airport and improve potential risk safety flight. Therefore, is needed innovation that is capable give solution effective and efficient in control system apron lighting automatic.

Automatic Floodlight Control (AUTOFCON) is present as solution innovative in study this. This System designed for automate Apron Floodlight control using light sensor principle. AUTOFCON is capable of operate without intervention humans (zero human intervention), with detect intensity light in real-time for arrange flow electricity that turns on or turn off apron lights in automatic (Kumar & Prasad, 2019). In addition, this tool designed for manage light data as base taking decision in operation system lighting. With implementation of AUTOFCON, it is expected apron operations at Class III UPBU Manrope Airport become more efficient, safe and modern, in accordance with demands of the digital era and revolution industry 4.0.

LITERATURE REVIEW

1). Technology Airport Lighting

Lighting at airports, especially in the apron area, is vital components that support operational flight. The apron is the area where parking aircraft, unload load cargo, and embarkation or debarkation passenger. System lighting in this area must fulfil standard safety and efficiency standards set by the Organization Flight Civil International Aeronautics and Space (ICAO) in Annex 14 Volume I Aerodromes. Standards This covers intensity lighting, distribution light, and reliability system lighting. In various airport, use system manual lighting still often found. This is cause risk operational, especially at night day or moment weather bad. Therefore, innovation system automatic such as Automatic Floodlight Control (AUTOFCON) is required for overcome limitations manual system.

2). System Automation in Infrastructure Flight

Automation in the sector flight has develop rapidly, including in field lighting. System automation like Photocell and light sensor has Lots applied in various application, because his ability for detect change intensity light in real-time. Principle Work Photocell is control flow electricity based on intensity light received. When the light low (night day or weather bad), Photosel in a way automatic turn on lights, and vice versa, turn them off. light moment light Enough bright. The study conducted by Kumar et al. (2020) By Generally photocells have 3 colors cable consisting of on Red, White and Black (Hendarto & Padillah, 2017). Photocell is a sensor, Sensor is a functioning equipment for detect symptoms or signals originating from from change an energy, sensors used in study This is an LDR sensor (Dicky et al., 2020). LDR is a type of resistor that has a value its resistance can changed in accordance with intensity the light it receives, if light dark mark resistance the bigger, while when light bright mark its resistance the smaller (Saputera et al., 2022). LDR often also known as tool or a sensor in the form of a responsive resistor to Light (Amalia et al., 2021). Because the value its resistance small this is what causes current electricity flowing and light lit (Putrid & Cholish, 2021). shows that use of light sensors in the system lighting can increase efficiency energy up to 40%. In addition, the system automation capable reduce need intervention human, so that more practical and reduce risk error operational.

3). Energy Efficiency through System Lighting Automatic

Modern airports are becoming more and more adopt technology lighting economical energy for support sustainability environment. Technology such as Light Emitting Diode (LED) and systems control automatic has proven can reduce consumption energy in a way significant. Research by Chandrasekhar et al. (2019) revealed that combination of LED and automatic sensor produce efficient lighting at a time reduce emission carbon. At Class III UPBU Manrope Airport, the apron lights use manual system that has potential result in waste energy moment light left alone light up without needs. The implementation of AUTOFCON, which is based on a light sensor, can give solution for ensure efficiency energy at a time increase safety operational. With light and current sensors, autofocus can Work maximum and efficient in condition weather whatever.

a. Floodlight Sketch Current condition with desired condition and LED light requirement for *back-up* .

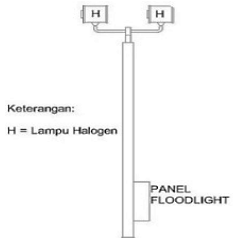

Figure 1.
Floodlight Current state

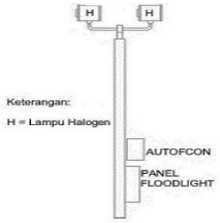

Figure 2.
Floodlight Desired state

In picture 1 there are 2 lights consisting of from 2 400-watt Halogen lamps with connected in a way parallel. (Data is stated on the packaging and attached in the "Attachments"). Based on calculation of KHA with NYA cable on the pulley the obtained conclusion KHA value 6.68 rounded up to be 7A or tolerated 10A, suitable for cable with wide cross section 1.5mm^2.

b. AUTOFCON Wiring

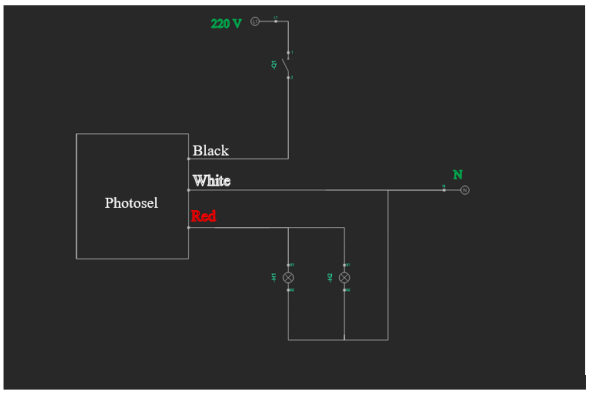

Figure 3. AUTOFCON Wiring

Voltage 220 Volts incoming to the Floodlight panel where in the panel. There is a Miniature Circuit Breaker (MCB) with a capacity of 4 Ampere, then output from the Floodlight panel enter to the AUTOFCON Box which contains Photocell has 3 coloured legs red, black, and white. Each colour own connection separately, for coloured feet black connected direct to source 220 Volt AC voltage, for the coloured one's white connected in a way parallel with cable neutral source voltage and cable neutral Floodlight lamps, while the coloured ones red connected to cable voltage Floodlight lamp.

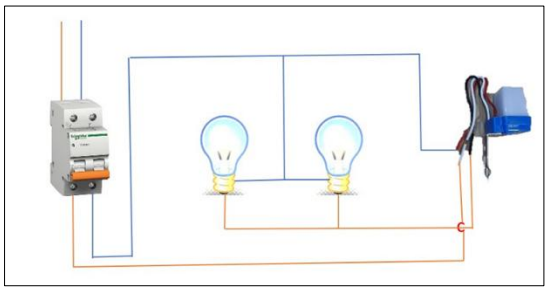

Figure 4. Installation Scheme AUTOFCON components

AUTOFCON installation begins with make sure the MCB panel is in OFF state. Then, Photocell Sensor connected with order as following: black legs to source 220 Volt AC voltage, white legs to cable neutral source voltage and neutral Floodlight lights parallel, and red legs to cable voltage Floodlight lamp. Photosel installed in place open that is not obstructed and get optimal light, as above Floodlight pole. After all connection finished, the MCB panel is turned on back, and system tested with close Photocell for ensure light light up automatic moment intensity light low. This scheme allowed floodlight lamp operating in a way automatic without manual help.

RESEARCH METHOD

Automatic Floodlight Control (AUTOFCON) Installation Flow

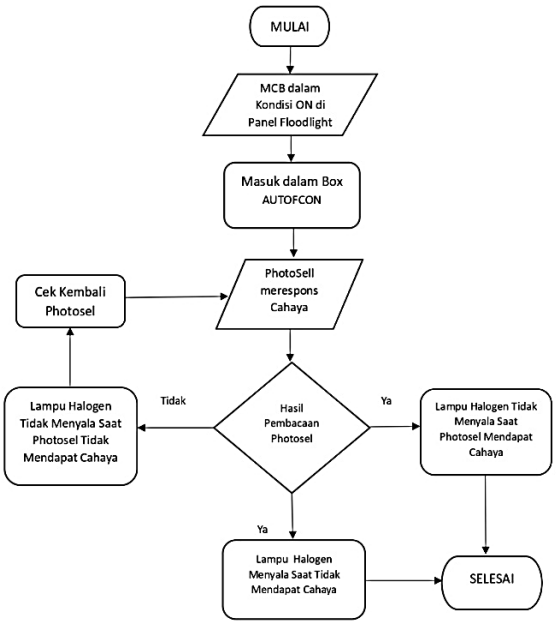

Figure 5. Flowchart Diagram

Installation of Automatic Floodlight Control (AUTOFCON) on the Apron Floodlight must be done with correct procedure for ensure system functioning optimally and safely. Here is procedure more installation detailed:

1. Initial Preparation
   a) Make sure installation performed by at least two technicians.
   b) Make sure technician own license electricity.
   c) Turn off the Floodlight panel MCB to ensure security.
   d) Check AUTOFCON (Photocell) device and tools Work.
   e) Get ready tool help like screwdriver, pliers, multimeter, and tools safety.
2. Cable Connection
   a) Identification three cable main on Photosel:
      - Black Wire: Source 220 Volt AC voltage.
      - White Cable: Neutral for source Voltage and Floodlight Lamp.
      - Red Cable: Voltage going to Floodlight lamp.
   b) Connect cable black Photocell to source 220 Volt AC voltage.
   c) Connect cable white Photocell in a way parallel with cable neutral source voltage and Floodlight lamps.
   d) Connect cable red Photocell to cable voltage Floodlight lamp.
3. Placement Photocell
   a) Place Photocell in an unsafe location obstructed object whatever.
   b) Put it on top Floodlight pole for get optimal lighting.
4. Activation System
   a) Check connection cable use multimeter for ensure there is no connection current short.
   b) Turn on return the MCB to the Floodlight panel to activate system.
5. Testing System
   a) Simulation condition Evening day:
      - Closed Photocell with object dark like cloth or carton.
      - Make sure floodlight lights on automatic.
   b) Simulation condition Afternoon day:
      - Remove the cover Photocell.
      - Make sure floodlight lamp is dead automatic.
6. Checking Overall
   a) Check repeat all connection cable for ensure there is no something loose.
   b) 6.2. Make sure Photocell installed solid in the right location.
7. Documentation and Submission
   a) Document it results installation, including Photo installation and location Photocell.
   b) Give training short to officer airport about usage and monitoring AUTOFCON system.

RESULTS AND DISCUSSION

Calculation Selection of Photo Cells used for AUTOFCON required:

1) Protection/ *Breaker*

$$I = \frac{P}{v}$$

$$I = \frac{800}{220} = 3{,}63A$$

Therefore, the Photocell used has a capacity of 6 Ampere and the protection used is *a Miniature Circuit Breaker (MCB)* with a capacity of 4 Ampere.

2) Cable type

I=P / (V x Cos phi)
I=800 / (220 x 0.85)
I=800/187
I=4.278 … (2)
KHA=125% x I
KHA=125% x 4.278
KHA=5.34A

So, based on calculation of KHA with NYA cable on the pulley the obtained conclusion KHA value 5.34 rounded up to be 6A or tolerated 10A, suitable for cable with wide cross section 1.5mm2

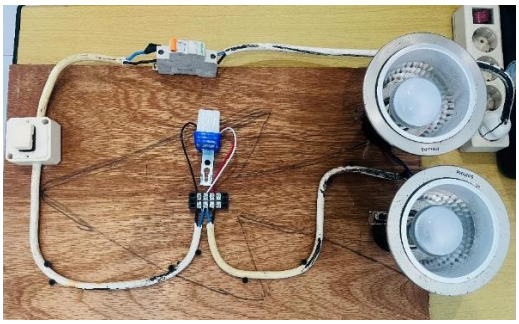

Figure 6. Autofocus moment get voltage and condition bright.

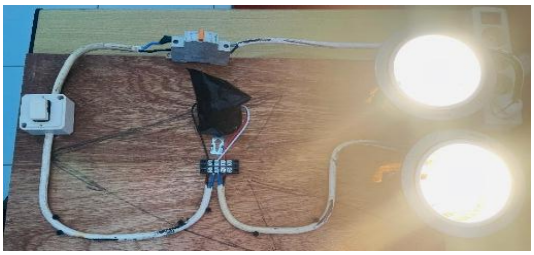

Figure 7. Autofocus when condition dark and get voltage

Implementation Automatic Floodlight Control (AUTOFCON) system on the Floodlight apron at Class III UPBU Manrope Airport show appropriate results with objective research, namely create system lighting automatic based on light sensor. Here table testing:

Table 1. Testing for Automatic Floodlight Control system (AUTOFCON):

No.	Scenario Testing	Initial Conditions	Action	Expected results	Test Results	Status
1	Testing light light up automatic moment dark	Photocell caught light bright	Reduce intensity light on photocell	Floodlight lights on automatic	Light light up automatic	Succeed
2	Testing light dead automatic moment bright	Photocell No caught light (dark)	Add light on photocell	Floodlight lamp is off automatic	Light dead automatic	Succeed
3	Response system to change intensity light	Photocell in condition dark	In general gradually increase intensity light	System respond in accordance change intensity light	System respond with Good	Succeed
4	Stability test current electricity	System in condition active	Measure Voltage and current on floodlight lamps	Voltage stable at 220 Volt AC	Voltage stable	Succeed
5	Manual testing of MCB panels	MCB in OFF state	Turning the MCB back on	System functioning return normally	System return functioning	Succeed
6	Influence placement Photocell	Photocell obstructed by objects	Move Photocell to open location	Floodlight lamps work optimally	System working optimally	Succeed
7	Internal sensor testing condition weather bad	Weather in condition overcast or Rain	Observing Photocell sensor response	Light light up automatic	Light light up automatic	Succeed

Based on testing, AUTOFCON successful detect change intensity light in real-time. When conditions light environment down, like at night day or moment weather bad, system in a way automatic activate Floodlight lamps. On the other hand, when intensity light increased, Floodlight lights off in a way automatic for save energy. The test results also showed that use Photocell as the main sensor give fast and accurate response to change light. The relay module used capable arrange current electricity with stable, so that Floodlight lamp works without disturbance. With installation Photocell in a strategic location (above) Floodlight pole, system can work optimally without obstacle physical that reduces effectiveness detection light.

Another advantage of this system is his ability Work with zero human intervention, which means No need interaction man in its operation. This is increase efficiency operational and

reduce potential risk manual error. In addition, this the system contributed to savings energy with ensure light only light up moment required.

Testing also revealed a number of things to do be noted. Weather factors extreme, such as Rain torrential or dust covering the Photocell sensor, can influence performance system. Thereforem, routine maintenance, such as sensor cleaning and inspection cable connection, to be step important for guard performance system in term long. In Overall, AUTOFCON proved to be become solution innovative, effective and efficient for management lighting in the apron area of Class III Manrope UPBU Airport, supports more operational safe, economical energy, and sustainable.

CONCLUSION

Based on results design Automatic Floodlight Control (AUTOFCON) system on the Floodlight apron at Class III UPBU Manrope Airport. Research results show that AUTOFCON is capable automate operation Floodlight based on intensity light environment using the Photocell sensor. This System can light up in a way automatic when light environment dim, like at night day or moment weather bad, and will dead return when intensity light sufficient, without need intervention human beings. This is give efficiency significant operations in the apron area.

In addition, the system This contribute to savings energy with ensure Floodlight only light up moment needed, so that help reduce consumption Power electricity at the airport. Tests were conducted show that AUTOFCON is capable respond change intensity light in a way fast and accurate. Use relay module and placement of Photocell sensors in strategic locations ensure system can operate in a way stable and optimal.

AUTOFCON also improves security operational in the apron area with minimize risk disturbance consequence delay or manual error in turn on and off lights. This is very important. For support activity flights, especially at night day or moment weather bad. However, research this also identifies potential obstacles, such as Photocell sensor error consequence dust, dirt or weather extreme. For guard performance system remain optimal, required routine maintenance in the form of cleaning sensors and checking connection cables.

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