17th International Scientific Conference
Energy and Climate Change
Athens, 8 – 12 October 2024

IMPROVING THE EFFICIENCY OF ELECTRICITY USE IN THE DURRËS PORT

Ajakida Astrit Bajram

ESKI BARDHI LEKA

SCOPOUS OF THE PAPER

The objectives of the paper is to analysis the energy consumption at Durrës port and to find way to reduce the of energy consumption in order to increase the energy efficiency, to improve the efficiency of port-related activities, to implement latest trends in energy use and energy efficiency and to protect the environment and minimize pollution

CONTENTS

1. Analysis of actual consumption in the port of Durrës.
2. Experimental data.
3. How can improve the efficiency of electricity in port Durres:
   - ✓ Instalation of L.E.D lamps.
   - ✓ Electrification of cranes.
   - ✓ Installation of solar plant at Durrës port.
4. Conclusions.

ANALYSIS OF ACTUAL CONSUMPTION IN THE PORT OF DURRËS

Energy Uses	Energy Costs in 2020 (€)	Energy Costs in 2021 (€)	Energy Costs in 2022 (€)	Average Energy Costs (€)
Electricity	€732,444	€703,111	€806,111	€747,000
Diesel	€85,545	€85,712	€84,162	€85,000
Gasoline	€3,626	€5,715	€7,138	€5,000
Total Average Costs for energy				**€839,000**

Energy Uses	2015	2016	2017	Average Consumption
Electricity	6,592 MWh	6,328 MWh	7,255 MWh	**6700 MWh**
Diesel	64.3 Ton	59.5 Ton	57.6 Ton	**60 Ton**

ANALYSIS OF ACTUAL CONSUMPTION IN THE PORT OF DURRËS

ANALYSIS OF ACTUAL CONSUMPTION IN THE PORT OF DURRËS

ANALYSIS OF ACTUAL CONSUMPTION IN THE PORT OF DURRËS

Type of light	Power	Quantity	Annual working hours	Yearly consumption	Energy prices	Annual cost
	kW	pieces	hour/year	kWh/year	Euro/kWh	Euro/year
Projector SAP - T	0.25	206	4015	206772.5	0.175	36,185.2
Projector SAP - T	0.4	32	4015	51392	0.175	8,993.6
Projector SAP - T	0.6	51	4015	122859	0.175	21,500.3
Projector SAP - T	1	89	4015	357335	0.175	62,533.6
Projector HQL - T	0.25	135	4015	135506.25	0.175	23,713.6
Fluorescent lamps	0.018	1672	4015	120835.44	0.175	21,146.2
Fluorescent lamps	0.036	272	4015	39314.88	0.175	6,880.1
total						180,952.6

EXPERIMENTAL DATA

To be as sure as possible about the saving of electricity in port lighting, we have done a study where in two towers with the same height (25m) and the same number of projectors (6 projectors), the replacement of the existing luminaries with brighter ones was carried out LEDs.

- ✓ Specifically, on one pillar, 6 SAP-T 600 W projectors have been replaced with 250 W LED lamps, which achieve the same luminous flux.
- ✓ On the other pillar, 6 SAP-T 1000 W projectors have been replaced with 400 W LED lamps, which achieve the same luminous flux

EXPERIMENTAL DATA

a) The tower with the existing luminaire of type SAP -T 1000 W – consumes about 80 kWh of electricity, providing a light flux of 15 – 45 lux at a distance of 1 – 15 m from the tower.
   - ✓ The tower with the 400 W LED-type illuminator – consumes about 32 kWh of electricity, providing a light flux of 15-45 lux at a distance of 1-15 m from the tower.

b) The tower with the existing SAP-T 600W type luminaire – consumes about 50 kWh of electricity, providing a 15-40 lux lighting flux at a distance of 1-15 m from the tower.
   - ✓ Tower with 250 W LED type lighting - consumes about 32 kWh of electricity, providing a 10-30 lux lighting flux at a distance of 1-15 m from the tower.

c) From the data obtained in the field, it results that the consumption of electricity is reduced by 60% if we use LED lamps instead of Low-Pressure Sodium HID lamps.

HOW CAN IMPROVE THE EFFICIENCY OF ELECTRICITY

- ✓ Installation of LED lighting systems.

Light Type	Quantity	Power	Required Output	Working Life	Average Unit Price	Total Price
LED Security lights	450 pcs	560 W	80,000 Lumen	50,000 hours	€400	**€180,000**
LED Street lights	75 pcs	80 W	12,000 Lumen	50,000 hours	€90	**€7,000**

HOW CAN IMPROVE THE EFFICIENCY OF ELECTRICITY

- ✓ Installation of LED lighting systems.

Metal Hallides	Number of lights	Power	Number of hours per day	Number of days per year	Price per Lamp	Annual Energy use Halides	Energy costs per year	Annually distributed cost	Annual Cost for Metal Hallides
Security lights	450	1,000 W	11 hrs	365 days	€20	1,300 MWh	€ 147,200	€2,600	€149,800
Street lights	75	150 W	11 hrs	365 days	€10	33 MWh	€ 3,700	€300	€4,000
Totals						1,350 MWh	€ 150,900	€3,900	**€153,800**

LED Lights	Number of lights	Power	Number of hours per day	Number of days per year	Price per Lamp	Annual Energy use Halides	Energy costs per year	Annually distributed cost	Annual Cost for Metal Hallides
Security lights	450	560 W	11 hrs	365 days	€400	736 MWh	€ 82,400	€5,400	€87,800
Street lights	75	80 W	11 hrs	365 days	€90	18 MWh	€ 2,000	€180	€2,200
Totals						750 MWh	€ 84,400	€5,600	**€90,000**

HOW CAN IMPROVE THE EFFICIENCY OF ELECTRICITY

- ✓ Installation of LED lighting systems.

As a conclusion:

1. The replacement of the current lamps with LED ones requires an investment of about €187,000.
2. From the tables above it is evident that annual costs of Metal halides are around €154,000, while annual costs of LEDs are around €90,000.
3. The annual savings from the replacement of halide lamps with LED fixtures is around €64,000/year. This is a good outcome, because it means that the savings will pay back the costs within 3-4 years..

HOW CAN IMPROVE THE EFFICIENCY OF ELECTRICITY

✓ Crane electrification

Parameter description	TEREX MHC 5150		Fantuzzi MHC 130	
	Diesel	Electric	Diesel	Electric
Average load	110 kW	110 kW	100 kW	100 kW
Assumed use of cranes per year	3,000 hrs	3,000 hrs	3,000 hrs	3,000 hrs
Total energy consumption per year	320 MWh	320 MWh	290 MWh	290 MWh
Fuel consumption / Electrical power factor	0.24 l/kWh	0.9	0.23 l/kWh	0.9
Annual consumption of Diesel / Electricity	77,000 l	356 MWh	66,000 l	320 MWh
Diesel/Electricity rate in Albania	1.435€/l	112 €/MWh	1.35 €/l	112 €/MWh
Yearly expense for diesel/electricity	**€110,000**	**€40,000**	**€95,000**	**€35,000**
Savings of crane electrification	**€70,000**		**€60,000**	

HOW CAN IMPROVE THE EFFICIENCY OF ELECTRICITY

- ✓ Installation of Solar plant.

HOW CAN IMPROVE THE EFFICIENCY OF ELECTRICITY

✓ Installation of Solar plant.

Parameter Descriptions	Yingli YGE 60	TrinaTSM325P D14	Hyunday RG series	Sunpreme Maxima 520	SunPower Maxeon 3
Efficiency	15.00%	16.70%	18.44%	20.2%	22.6%
Solar insolation	1800 kWh/m^2	1800 kWh/m^2	1800 kWh/m^2	1800 kWh/m^2	1800 kWh/m^2
Performance coefficient	75%	75%	75%	75%	75%
Buildings					
Area of Building Roofs	13,600 m^2	13,600 m^2	13,600 m^2	13,600 m^2	13,600 m^2
Energy produced	2,750 MWh/yr	3,000 MWh/yr	3,400 MWh/yr	3,700 MWh/yr	4,100 MWh/yr
Parking Lots					
Area of Parking Lots	16,000 m^2	16,000 m^2	16,000 m^2	16,000 m^2	16,000 m^2
Energy produced	3,250 MWh/yr	3,600 MWh/yr	4,000 MWh/yr	4,400 MWh/yr	4,900 MWh/yr
Total Energy produced	**6,000 MWh/yr**	**6,600 MWh/yr**	**7,400 MWh/yr**	**8,100 MWh/yr**	**9,000 MWh/yr**

CONCLUSION

- ✓ Crane electrification

- ✓ The cranes at Durrës port are diesel-power where convert the energy of fuel into electric energy to power up the moving parts, the energy consumption by these is considerable.
- ✓ Annual energy consumption of Metal halides lights is around €154,000, a considerable value.
- ✓ Base the data of energy consumption, the yearly consumption of energy at Durres port varies from 6300 to 7300 MWh, while the average consumption is 6600 MWh.
- ✓ It is hard to predict, whether this consumption will increase as a result of increased business, or will decrease as a result of energy efficiency measures that will be taken in the future.
- ✓ The annual savings from the replacement of halide lamps with LED fixtures is around €64,000/year. This is a good outcome, because it means that the savings will pay back the costs within 3-4 years.

RECOMMENDATIONS

- One of the fastest and most efficient ways to reduce electricity consumption is to replace the current lamps with LED lamps in all areas of the facility.
- The consumption of electricity is reduced by 60% if we use LED lamps instead of Low-Pressure Sodium HID lamps.
- The best scenario towards this intention is the substitution of diesel with electricity from the grid, since electricity is relatively cleaner and will minimize greatly the pollution locally.
- Installing PV panels to produce energy is one of the best ways to generate renewable energy and to reduce significantly the pollution.
- The generated energy from PV panels can be used for the internal needs of the port and to minimize electricity taken from the grid.