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Review Article

Optimal Use of Port Cranes to Maintain the Environment of Port Cities

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Abstract

Through the different dimensions of the problem that appeared with carbon emission standards according to the authorities ports through the useful life of the cranes and now the homogeneity and commitment to new environmental requirements and where the problem lies in the number of cranes using diesel as fuel to produce operating power can be used by using the so-called flywheel for energy storage as a power regeneration system to help reduce the maximum power requirements on RTG cranes used for loading or unloading ship loads. Where the operator can make minor adjustments by deploying a new smaller generator for RTG operation. This generator will reduce fuel consumption, reduce emissions and reduce operational costs of reducing the amount of fuel that can over the long term offset the proposed additions and modifications. The current paper is detailed. The current paper focuses on reviewing the amount of energy and fuel consumption that can be reduced in Tired Gantry (RTG) rubber cranes in container terminals using simulations. The variable speed generator will be integrated into the RTG and simulation results show that total energy savings will exceed 30% relative to conventional RTG. Which is proposed to include variable frequency drive (VFD) and brake resistors.

Keywords: *RTG; Terminal; Fuel; Container; VFD*

Introduction

A number of variations and modifications can be used in the current proposal based on the following constants. For example, in any set of primary energy, basic backup power systems and energy storage can be used on any RTG crane such as the upper lift or lift system. In the case of an elevator system, power systems can be installed on the surface near the elevator shaft. The current proposal includes different scenarios for the components, methods, processes, systems and/or devices, as described in this paper, which includes different configurations, sub-assemblies and sub-assemblies. Skill and expertise in this area will understand how to make and use the current proposal after fully recognizing and understanding its aspects and is an example of improved performance, ease and/or reduced implementation cost.

The challenge features, statement and overview

RTG is the major contributor to the carbon footprint of seaports and is another major issue added to air pollution issues in seaports, a source of carbon emissions and a source of greenhouse gases. The large-displacement diesel generators include almost all RTG cranes, such as diesel generators that allow RTG the flexibility they need to move between corridors to complete container storages, and power that container terminals move containers at scheduled speed and avoid stacking. However, the diesel generators currently used in the RTG groups are a strong consumer of the energy source, which is the fuel. Here comes the increase in operating costs, especially with the rise in global fuel prices and secondly the source of emissions that cause many cancer diseases, especially for the cities where these ports are located. The total costs of operation of seaports, especially in light of the steady increases in the globalization operations and the direction of economies of scale.

The main task of the container terminal equipment (CTE) on the side of the quay is the trading of containers of various types and density, which is the main task of the port, but the critical aspects of this equipment is the negative impact on the marine environment and air for its dependence on fuel to generate the electrical energy necessary to operate the equipment of various kinds, Pollution and air pollution caused by serious diseases such as cancers of various kinds and the current project works to the compatibility between the economic aspect of the operation of the equipment and the environmental side so that it does not result in additional costs to reduce profits Which is expected from the operators of the port terminal where the equipment varies in terms of technical specifications of each and through some technical solutions can reduce carbon emissions and also benefit commercially and through the restructuring of the operation of the equipment, which is illustrated by the current research where it is located on the sea side to exercise the task Its basic of loading and unloading the docking ship as soon as possible. Due to the large size of the container handling equipment (CHE) and its exposure to the sea, this requires the application of technical techniques during the transport of containers to and from the water operations and to and from the assembly area of containers by vehicles.

Therefore, the research paper analyzes the options for greening of bridge cranes and rubber cranes (RTG) in seaports in terms of energy consumption rates and emission reduction methods. In order to achieve the overall goal of the integrated preservation of the health of the population in the cities of ports and reduce the source of cancer, where solutions will be provided from the point of storage of waste energy, and reduce the time inactive, and improvements in the movement of movement of the sun, and the use of alternative fuels. The decision-making criteria are used to provide justification for the condition of the Crane as one of the solutions, which included meeting capital requirements in terms of operating cost overruns according to actual operation. Finally, information was provided on the local and global impact of emissions, the potential challenges to the implementation of the solutions put forward and the opening for further studies.

Objectives of the Study

We have several objectives:

1. Survey the current landscape of technology to reach the most appropriate solutions that may reduce the use of power of the crane RTG and emission outputs that correspond to the dimensions of the current challenge.
2. Identify the available technologies available in the commercial market taking into account the dimensions of operating costs.
3. Evaluate both the technical performance of the cranes as well as the financial performance and the emissions resulting from the implementation of each option.(included in final report).
4. Preparation of a survey of the operational feasibility of implementing the expected technology (In the final report).
5. Preparing standards for commercial feasibility and standards of success (In the final report).

Summary of solution

Based on our findings, we recommend the following:

1. From a financial considerations perspective, net present value (NPV) positive technological options with likely payback period of under 10 years include a diesel electric hybrid solution with energy storage using ultra capacitors, an engine start-stop system to reduce idle time, and the adoption of CNG as an alternative fuel (In details will be with final report).
2. From an environmental considerations perspective, we analyzed the different retrofit options from the perspective of global carbon dioxide (CO_2) emissions as well as local tailpipe emissions of nitrous oxide (NOx), sulfur oxide (SOx), carbon monoxide (CO), hydrocarbon (HC), and particulate matter (PM). The options have varying levels of impact on these different types of emissions, and each port would need to assess which combination is best suited to meet their objectives.

Cranes form a major portion of cargo handling equipment at any container port. Many of these cranes employ heavy-duty diesel engines, and emissions from these engines have a very direct effect on air quality in and around the port.

RTG cranes straddle multiple lanes of stacked containers, and can move 20 or 40 foot long containers weighing up to 65 tons, rubber-tired gantry cranes run on rubber tires that enable them to move from one line of stacked containers to another. The capacity of an RTG is defined by the maximum height and width of the stack, the maximum weight of the container that can be lifted, and the power of the onboard diesel engine if applicable. As an example, the RTG has a maximum lifting height of '1 over 6' and a maximum span of '7 + 1 truck lane'. The suspended portion of the crane, which receives the container, is called the "spreader". The main purpose of an RTG is to load and unload containers from trucks, and for the on-shore movement of containers.

The plurality of RTGs in use today are powered by large diesel engines. The engine runs a generator to produce electricity. All cranes drives are powered by electric motors using the electricity generated onboard. RTGs function by making three basic movements:

1) Hoisting (and lowering) movement- Router to or dedicated to raise (or lower) the spreader

2) Trolley movement - to move the spreader transversely across and among the stack

3) Gantry movement - to move the entire crane along the length of the stack.

The maximum potential for regenerating power on an RTG crane is while lowering a container; energy can be captured from the movement of the crane, which occurs by virtue of the container's own weight.

Although the student research team was able to explore many solutions by studying the titles of the title of the current challenge, the team tends to the solution can be implemented in a short time through a training course for employees of the North Valley station through the operator, which spent huge investments 11 years ago only Taking into account not to Incurs additional expenses and the available solution depending on to study the stages of the movement of the crane as noted above and work on the method of storage and energy saving.

Key finding

The area refers to the relationship between time in minute and energy demand (KW), which according to previous studies indicates the following (Loading stage).

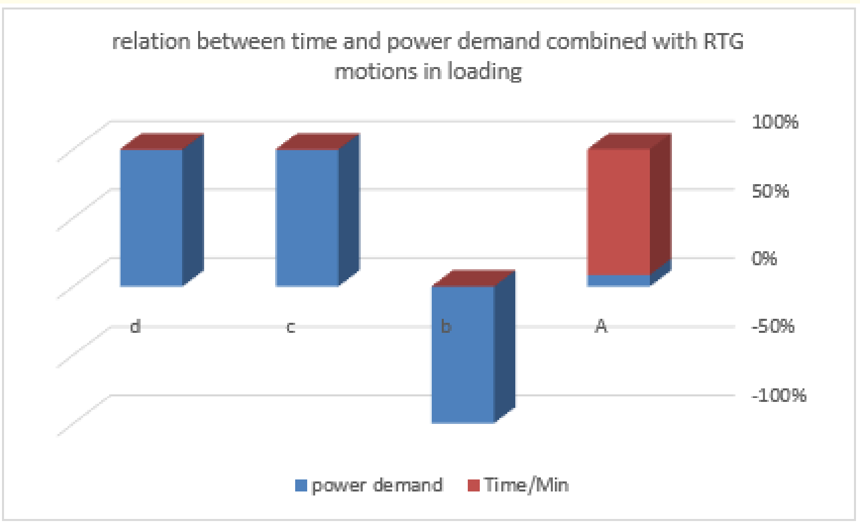

Figure 1

The above chart indicates strength indicators resulting from reduced movement of the Crane in the case of an inactive arm in a mechanical movement of the CREN. It also clearly shows the peak time in the power demand and operation of the arm where the lift movement begins. Studies have shown that power jacks are generated for 18 minutes during each hour of operation. The renewal capability is expected to be similar to RTG cranes. In addition, the maximum power requirement on an RTG diesel engine is only 4% of the total operating time, which means that if peak power demand can be reduced, the size of the diesel engine can be reduced and therefore wasted energy is saved.

The traditional demand for energy during loading and unloading of a 40 ton container from a truck on the stack (grade 6, height 5) indicates A-F to the movements: a. Move the cart over the pick point (either above the stack or truck); b. Reduce the empty distributed energy on the container; C. Lift the container to clear the top of the stack; Move the container to the release point; To the empty filter from the container.

Besides the continuous power during each move, the motors need to accelerate and overcome the inertia of the crane's moving parts such as the big cable reels. This creates a peak of extra power demand at the start of each movement. On the other hand, there also is a peak of negative power each time the crane decelerates at the end of each movement, albeit somewhat smaller because of the losses in the electric motors and inverters.

The power demand during each the motion with section "A" to "F" it will depends on the required power force, while the speed of the movement and the efficiency of the motors and inverters. The required force can also be negative or useless when the container is lowered or during braking, the modeled power require demand during both loading and unloading moves. When the power demand is positive, the crane has to supply power to the electric motors. During the sections where the power demand is negative, energy is released to the crane, e.g., during braking or lowering of the container. In regular cranes this energy is dissipated by the brakes, but the hybrid ECO-RTG can store it in the ultra-capacitors so it can be reused later on. It is clear that the hoist movements dominate the power demand of the crane. The influence of the speed of the movements is visible by relatively small difference in the height of the peaks when the crane is empty and when it is full, e.g., between "B"' and "E". The peaks in the demand during acceleration and deceleration are also visible. Through the different dimensions of the problem that appeared in the northern station of the valley in terms of full compliance with carbon emission standards according to the authorities of the valley and since the operator has invested not long ago through the useful life of the cranes and now the homogeneity and commitment to new environmental requirements and where the problem lies in the number of four Twenty cranes using diesel as fuel to produce operating power can be used by using the so-called flywheel for energy storage as a power regeneration system to help reduce the maximum power requirements on RTG cranes used for loading or unloading ship loads. Where the operator can make minor adjustments by deploying a new smaller generator for RTG operation. This generator will reduce fuel consumption, reduce emissions and reduce operational costs of reducing the amount of fuel that can over the long term offset the proposed additions and modifications. The current paper is detailed. The current paper focuses on reviewing the amount of energy and fuel consumption that can be reduced in Tired Gantry (RTG) rubber cranes in container terminals using simulations. The variable speed generator will be integrated into the RTG and simulation results show that total energy savings will exceed 30% relative to conventional RTG. Which is proposed to include variable frequency drive (VFD) and brake resistors. A number of variations and modifications can be used in the current proposal based on the following constants. For example, in any set of primary energy, basic backup power systems and energy storage can be used on any RTG crane such as the upper lift or lift system. In the case of an elevator system, power systems can be installed on the surface near the elevator shaft. The current proposal includes different scenarios for the components, methods, processes, systems and/or devices, as described in this paper, which includes different configurations, sub-assemblies and sub-assemblies. Skill and expertise in this area will understand how to make and use the current proposal after fully recognizing and understanding its aspects and is an example of improved performance, ease and/or reduced implementation cost..

Solution features

Load lifting device includes:

1. At least one motor to drive the mechanical lifting device that has the capacity to raise the maximum rated load.
2. At least one power storage unit to store electrical power and supply power to at least one motor, with output capacity storage (energy storage unit).
3. At least one major power system with the power to generate the power system, electrically connected to at least one power supply and at least one motor to provide electrically to the power unit referred to in the preceding clause.
4. A unit that electrically connects at least one power supply, at least one main power system and at least one motor.
5. Control system to control the operation of at least one main power system and the lifting device. To monitor at least one power supply, Where at least one engine receives operational power selectively from at least one power supply and at least one main power system, at least one engine provides recharging power when the lift device reduces the load, where the ratio of the power system The main at least one of the estimated energy to peak load energy is between 0.2 and 0.7.
6. Here is the Load Lifting 1 where the power supply returns the regenerative braking power to at least one power supply to increase the stored power when the load-lifting device reduces the load.
7. The load-lifting device 1 the electric carrier returns the regenerative braking power to at least one main power system when the load-lifting device reduces the load.
8. The load-lifting device 1 the electric carrier returns the regenerative braking power to at least one energy storage unit to increase the stored power and then transfers it to the main power system at least one when the lift device reduces the load.
9. The proposed lifting Load 1 has an energy storage capacity of between 100 and 5000 kWh, while the capacity of an energy storage unit is between 50 and 2500 kW.
10. Where the Load lifting referred to 1 has the capacity and capability to supply the main power system and at least one card ranging from 50 to 5000 kW.
11. Lifting device for load 1 where the main power system includes at least one main source of energy selected from the group consisting of engines, diesel engines, gas turbine engines, small turbines, spark ignition engines, fuel cells, solar cells and electrical networks, controlled induction systems, A combination of that.
12. The proposed Load Loader 1 includes an energy storage system based on an energy storage system chosen from a battery pack, a bank of condensers, a compressed air storage system and one or more flywheels and a proposed combination. In this case, the load-lifting device of the application 1 shall be the energy storage unit part of the weighing load in the load-lifting device. Load Loader 1 the lifting device is selected from a group consisting of cranes, gantry cranes with rubber tires, overhead cranes, mobile cranes, and cranes from ship to shore, container cranes. In this case, the lifting devices 1 have not only the lifting capacity, but more than the ability to carry energy dissipation to replace the renewable energy on the electric carrier.

The lifting device 1 also includes an additional power system connected to the electric bus.

Proposed load-lifting device 1 A control system includes a selected controller of a group consisting of analog devices and programmable logic controllers on computers.

Load lifting 1 A load-lift device is a rubber bridge consisting of legs. At least one main power system is installed between each pair of legs mentioned near the end of the bottom of the legs.

Load lift device 1 Also where the load lifting device is a rubber bridge consisting of legs, and the installation of at least one energy storage between a pair of legs mentioned almost to the bottom end of the legs mentioned. In this case, the load-lifting device 1 where the load-lift device is a rubber bridge with legs, at least one of the legs is attached to the first pair of the above mentioned legs to fix the legs on the side The first of the jumper and the first main power system at least between the second pair of legs mentioned almost at the bottom end of the second pair of legs on the other side of the jib crane.

The load-lifting device 1, where at least one energy storage unit and at least one main power system are measured, are provided in an upgradeable model with receivers on a load-lifting device. It receives diesel engine and generator set. The load-lifting device mentioned 1 where at least one motor is selected from the set consisting of variable-speed drive motors, AC motor drives and DC motors. Load Loader 1 where at least one energy storage unit provides power regulation for at least one main power system [1-7].

Conclusion

Ports in general contain many equipment and kernels according to the type of goods that are traded with different types of ships. This causes the environmental pollution of the cities where these ports are located in terms of the carbon emissions resulting from the operation of this equipment, which often exceeds international rates and rates Which is implemented through international agreements such as MARPOL and port safety, which the current paper aims at in terms of solutions to reduce emission rates, which are inexpensive solutions in the short term and which depend on reducing fuel and emissions in the case of arm movement Which would reduce fuel consumption and decrease carbon emissions as well as reduce operating costs.

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