Manitoba 57 Infrastructure and Transportation

120 Volt Traffic Signal System Utilizing Wireless Communication For Temporary Installations

Traffic Engineering

Introduction

In our province, aging infrastructure and severe flooding over the past two decades have us replacing or undertaking substantial repairs to our bridge network. These replacements or repairs typically require a two lane highway to operate as one lane for both directions necessitating some form of traffic control.

Traditionally, trailer mounted Portable Traffic Signal Systems (PTSS) powered by 12 volt DC batteries recharged by solar panels are used in these applications. The trailers are easily deployed and can be setup on short notice.



Flooded Highway Controlled by PTSS



Bridge Under Repair Controlled by PTSS

The PTSS can operate for indefinite periods of time where the climate is conducive to adequate solar charging, and have proven to be very reliable for projects of short duration which do not extend into the cold, snowy winter months.

Two year bridge replacement and rehab projects that extend into winter months require the use of more reliable semi-permanent traffic signal installations. In these cases we have traditionally installed a NEMA Standard 120 volt AC traffic signal controller which requires hard wire connections to all signals. Unfortunately circumstances do not always permit hard wire interconnection between signals because of distance between signals, or construction activities and safety concerns.



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III Objectives III

Design a System:

- Which can be powered by a reliable stable power source.
- 2. That will utilize the same controller as the solar powered 12 volt DC system to reduce spare part inventory.
- 3. Where the control signals at the project start and finish points can be 500 to 1000 meters apart.
- 4. Which does not require cabling between the control signals at either end of the project.
- 5. Which will keep operating during snowy, cloudy, cold weather conditions.
- 6. That is easily installed and in a short time frame.
- 7. Where one pole can be utilized to support two traffic signal fixtures, a hydro service, vehicle detection equipment, traffic signal control box and street lighting.
- 8. Where the signals at each end of the project are monitored for conflicting indications as well as lamp outs for safety reasons.

Summary and Results

Working in conjunction with manufacturers, Manitoba Infrastructure and Transportation's Traffic Engineering Branch, was able to have a system developed which meets all objectives. Manitoba's unique solution involves the use of a wireless communication 12 volt DC system which has its battery bank held at a constant level of charge through the use of 120 volt AC smart charging equipment, thereby eliminating the deep discharge, recharge cycles of the solar powered systems, as well as providing several hours of battery backup operation when the grid power goes down.



Control Box With Battery Tray



Smart Charger





Batteries in Pull-Out Tray

The design allows the use of the same controller for either solar powered systems (PTSS) or 120 volt AC powered systems, thus reducing the need of redundant stocking, in case of failure. The controller may be programmed to operate in a fixed time mode or in a fully actuated mode utilizing any one of multiple vehicle sensor types.



Antenna Mounting Height Adjustable

Conclusions

The ease of installation reduces the labour costs and the wireless communication system eliminates cabling expenses and voltage drop issues associated with long runs of cable. Removing the cable runs also allows construction projects to proceed unimpeded by the cables and it removes the issue of having to design methods to establish hard wiring from Signal A to Signal B.

Safety concerns with conflicting signals are addressed through the use of an embedded malfunction management unit and the remote monitoring system allows for quicker response times by the technicians and supplies them with instant trouble shooting information.

The flexibility in mode of operation programming greatly improves the efficiency of the system and allows it to be used in many different project configurations. Manitoba Infrastructure and Transportation currently has four such systems in operation with great results and reviews.

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All communication between signals including monitoring is accomplished wirelessly through antennas. The mounting height of each antenna is adjustable to allow line of sight to other signal.

The system includes a remote monitoring system which allows the user to receive email or text messages to provide notification of system malfunctions or low battery warning. Communication with the units can be via cellular phone service where available or satellite phone service in remote areas.



System in Operation