

A Trolling Motor Dilemma

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Contributing Writer

A reader recently contacted me with a problem concerning his trolling motor installation. It seems the wire connecting the batteries to his trolling motor would get hot, and the trolling motor would shut down after protracted use. It would then take a long time for the thermal relay on the motor to reset. It was actually a good thing that the motor shut down when it did. Further use under those conditions may well have overheated the wire to the point where it would catch fire.

The problem is that the wire size is too small. In addition to the heating effect from the amperage the wire was carrying, the capacity of the battery was being consumed by the voltage drop over the undersized wire.

Batteries

Before dealing with the problem, let's discuss some basic battery information. The vast number of trolling motors use deep cycle marine batteries. These are constructed differ-

ently from starting batteries. Lead-acid batteries are composed of a series of plates. These plates are thinner in starting batteries and provide the high amperage current required to start an engine. After the engine starts, the alternator takes over the electrical load and recharges the battery. This type of battery is not designed for deep discharge and recharge; such use will soon destroy the battery.

Deep cycle batteries, on the other hand, have thicker plates and are designed for many, many deep discharge/recharge cycles. They don't provide as high an amperage output as a starting battery but can provide their power over the long haul.

“Regularly check the electrolyte levels in your batteries and use only distilled water to top them off.”

However, even deep cycle batteries do not like being completely discharged. For longest life, deep cycle batteries shouldn't be discharged more than 50% of their capacity before recharging. Constant discharging below 50% will shorten the life of the battery.

Calculating the length of time a given battery installation will power a trolling motor is a complex one. The amper-



age use will vary depending on the power setting and will directly affect the operating time. Most folks get as many batteries as they can easily afford and install, then limit their trolling motor use according to the capacity they have.

Lastly, more batteries have died from poor charging and neglect than any other cause. Buy a proper three-stage marine battery charger and use it. Regularly check the electrolyte levels in your batteries and use only distilled water to top them off.

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Wire

Want instant sticker shock? Price marine grade wire. The recent rise in copper prices has had their effect on the price of marine wire, too. However, don't be tempted to use non-marine grade wire.

Marine grade wire is stranded, made from a great number of smaller wires stranded together. This stranding provides the flexibility to withstand the vibrations and movement of the wire aboard a boat. Solid wire will soon fatigue and break when used aboard a boat.

Marine grade wire is all tinned; that is, each strand is tin plated. That reduces the corrosion of the wire strands. When untinned copper wire begins to corrode, that corrosion increases the resistance at connections. That



resistance translates into heat, wasted amperage, and eventually overheating with the possibility of a fire. Stay with tinned marine wire as well as properly sized and tinned marine connectors. Marine wire is also properly insulated for the boating environment.

Solving the Problem

The actual question that the reader asked was what size wire to use. That turns out to be a question that only the boat owner, trolling motor installer, or marine electrician can properly answer. The reason is that the wire size depends on several things. The first is the length of the wire run, which is the distance from the source of the power to the device being powered AND BACK! In other words, the current has to run through the wires to and from the trolling motor.

The second issue is that of voltage drop. DC electrical systems aren't used by the national electrical grid because of the large voltage drops incurred by long wire runs. Edison and Westinghouse battled that issue out years ago, but AC systems aren't available for trolling motors. The smaller the wire size for a given current, the higher the voltage drop and the more battery capacity lost.

There are charts and calculators available showing wire size as related to the length of wire and the current being carried. These charts are usually offered showing both a 3%

voltage drop and a 10% voltage drop. The wire size for a 10% voltage drop will be smaller (and therefore cheaper) than a 3% voltage drop wire, but will be 7% less efficient in carrying that power. If followed, either choice should carry the required amperage safely.

These charts can be found online at sites like Ancor Wire, in many marine catalogs, and in books like Nigel Calder's *Boat Owners Mechanical and Electrical Manual*. That book is a great resource for planning the safe and proper installation of any marine electrical system.

To sum it up, the reader's problem was due to undersized wire being used to connect his trolling motor to his batteries. He needs to calculate the proper wire size for his trolling motor and wire length and install the proper sized marine-grade wire. He can also consider moving the batteries closer to the trolling motor to reduce the length the wire runs, assuming that won't adversely affect the trim of his boat.

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