What makes Balmar alternators and regulators so special?

In order to really understand the difference between Balmar charging equipment and the average alternator and regulator, it's important to understand our goal in designing and building a Balmar alternator.

In an automotive application, the alternator's function is to keep a starting battery happy while supplying power to electrical/electronic operations needed to operate the vehicle (i.e., headlights, cassette deck, vanity mirror lights, etc.). In this environment, a simple, internally-regulated alternator is usually more than sufficient to get the job done.

In the marine environment, the alternator and regulator must support a much greater battery capacity to fulfill engine and house battery loads. The alternator and regulator must also be able to charge effectively at lower rpms and live in an inhospitable environment. In addition, the alternator and regulator may sit for long periods between uses (surprisingly, one of the toughest aspects of alternator life). At the same time, this system must meet the expectations of boaters that want to have their batteries charged within the least amount of engine run time.

To meet those challenging conditions, a high-output marine alternator begins with high amperage diodes, larger, higher-quality bearings, and a durable frame, that's protected against potential corrosion damage. Balmar applies a durable powdercoat finish to protect the alternator from rust and corrosion.

Another thing that sets a Balmar alternator apart from the rest is the technology we use to create our rotors and stator windings. The rotor/stator combination is the primary factor in controlling the amount of top-end output, low-end output and cut-in level (how slowly the alternator can turn and still make useable amperage). The rotor and stator combinations in Balmar alternators are custom wound and calibrated to maximize output, not just at top end, but also at the low end of engine rpm.

But, that's just half the story ...

Balmar has been one of the industry leaders in creating intelligent voltage regulation that enables us to meet the needs of newer battery types, and the added load that modern electronics and inverter technology demand. Intelligent regulation, like that provided by our Max Charge and ARS-4 regulators, matches the output of the alternator to the specific needs of your batteries (AGM, gel, Optima, deep-cycle flooded, etc.) so batteries charge faster based on the needs of their unique constructions, and we can most effectively utilize the added capabilities that our alternators provide. And we've done it in a way that doesn't require the end user to be an engineer to get the most out of their charging systems.

In addition, many of our voltage regulators are equipped with the ability to monitor both battery and alternator temperature, and respond by increasing or decreasing voltage levels to maximize both safety and performance. In the event of a condition that poses danger to the system or the vessel, the regulator has the ability to discontinue charging completely.

Do I really need a high output marine alternator on my boat?

If your vessel's DC system is limited to a standard flooded starting battery that supplies minimal house loads, your engine's standard alternator will probably be sufficient. On the other hand, if your vessel features multiple battery

banks, substantial house loads and/or inverter loads, or battery technologies like AGM, gel or deep cycle flooded batteries, you will see a radical improvement in your vessel's charging performance with the introduction of smart regulation and a high-output alternator. In addition, high quality marine alternators also benefit your vessel in the fact that they are built to handle the environmental conditions specific to marine applications. Larger bearings, custom-wound stators with larger gauge wire, higher amperage diodes, as well as a powdercoat protected case all work together to ensure longer alternator life.

Which alternator is right for my charging system?

Alternator selection depends on three primary factors. The first factor is mounting configuration and physical fit. Most marine gas and diesel engines will feature one of four mounting types, compatible with one of four alternator mounting styles; 1" single foot (Motorola-style), 2" single foot (Delco-style), import (Hitachi) style saddle mount with 3.15" between front and rear feet, and J-180 style saddle mount with 4" between front and rear mounting feet. The Balmar Product Guide (click here) features an application chart that matches many engine types to alternator mounts.

Keep in mind, though, that mounting styles may vary based on engine year and model. A visual inspection of your specific engine and existing alternator is the most dependable method for ensuring a proper new alternator fit. Dimensional drawings for all of our alternators are available on our website. Be sure to identify any engine components which could conflict with the alternator case or output connections at the back of the alternator.

The second factor in determining proper alternator fit requires matching the alternator's output to the width of the engine's drive belt. If your engine uses a single 3/8" (or metric equivalent) belt, the largest recommended alternator will be 80 amps. A single 1/2" (or metric equivalent) belt can support up to 110 amps of alternator output. Dual 3/8" or larger belts can support up to 200 amps of alternator output. Any alternator loads in excess of 200 amps will require dual 1/2" or larger belts.

The final factor is battery capacity. In an ideal world, alternator choice would be determined based on the factors above, prior to selecting batteries for the vessel. Unfortunately, batteries are often installed before the alternator is selected, so we're limited in our ability to control this part of the equation. If, however, we do have the opportunity to consider battery size when selecting an alternator, a good rule-of-thumb is to size your alternator at approximately 25% to 40% of your desired battery capacity.

If your intended battery capacity demands greater alternator capacity than the first two factors allow, it may be necessary to look at upgrading pulleys and/or brackets to support a larger capacity alternator to meet battery needs.

What horsepower load will I put on my engine with a new alternator?

Typically, when an alternator is working at full output, it will require approximately one horsepower for every 25 amps it produces. As such, a 100-amp high-output alternator will re up to four horsepower to operate.

Does belt choice affect alternator performance?

Certainly, belt quality will have a dramatic affect on both alternator performance and the life of the belt itself. We find that high quality belts, such as the Top Cog belt by Dayco or the Green Stripe belt by Gates, will provide the best performance and longest life possible.

Keep in mind, the width of the belt limits that belt's horsepower capacity. As a result, any belt -- no matter what quality it might be -- will fail before its time when the alternator load exceeds the belt's capacity. Once again, if the belt is narrower than 7/16", the maximum amperage load we can safely carry is 80 amps. If the belt is 1/2" wide, 110 amps is our upper limit. Any alternator in excess of 110-amp output will require dual belts, or multi-groove flat belts.

How much amperage is safe for my system?

Forget the rumor that an oversized alternator will destroy your batteries ... the truth is that the acceptance rate of your batteries will dictate how much amperage the alternator will provide. While we recommend that you try to size

your alternator to represent 25% to 40% of your overall battery capacity, an oversized alternator will not pose a danger to your batteries and, in most cases, will provide a much longer alternator life, as the alternator is required to work at a much lower percentage of its capacity. In all cases where a high-output alternator is used, we strongly recommend using a smart, multi-stage regulator. In addition to enabling the DC charging system to more effectively get batteries charged, a Balmar multi-stage regulator allows us to provide a charge that considers the safety of the alternator and batteries as well. Alternator temperature sensing, battery temperature sensing and careful charge control, based on precise monitoring of battery voltage, all contribute to a safe and effective charge.

How do I charge more than one battery bank?

That depends on the batteries. If you're taking care of a larger house battery and a smaller house battery, there are a couple of approaches. First, and often the most common method is a pair of ON/OFF switches or an A/B/BOTH switch that allows you to control the direction of charge from the alternator to the batteries.

Switches do provide an inexpensive, easily-monitored method for charge control. Yet, they do require that their operator knows when and which switch to adjust … and there's always the possibility that cousin George will accidentally flip the switch to OFF while the engine's running, and turn the alternator's diodes into molten metal. Should you do use selector switches to control charging output, we do recommend that you use "field disconnect" type switches. Field disconnect switches feature a couple of extra terminals that allow the installer to break the field connection between the regulator and the alternator whenever the switch is turned to the OFF position, so cousin George will have one less way to trash your charging system.

Other charge control devices, such as combiners and isolators, provide a bit more of an "automatic" method for isolating and merging battery banks with the help of solenoids and isolating diodes. Under the right conditions (primarily when joining banks that are similar in size and the same technology) combiners and isolators can be very effective.

Isolators can create some problems, though, when used to support dissimilarly sized battery banks. Isolating diodes used in most isolators can rob nearly a volt from the charging system, which forces the alternator to operate at a higher than normal voltage to bring the batteries to their target charging voltage. The regulator can sense voltage at only one of the isolator's outputs, so it's difficult to protect the second battery bank from undercharging or overcharging. This can result in overcharging at the start battery, or perpetual undercharging at the house battery bank.

Combiners, on the other hand, use solenoid switches to merge the battery banks when charging voltage is detected. While this is certainly a preferable choice over isolating diodes, combiners cannot adequately respond to systems with differing battery technologies – such as combinations of deep cycle house batteries and standard thin-plate cranking type batteries.

This is where Balmar's new Digital Duo Charge really shines. The Duo Charge is the first product available that provides separate selectable programs for different battery types, so you can use a big, thick plate golf cart battery for your house bank and a thin plate starting battery to crank your engine. The Duo Charge will only connect the two battery banks when charging voltage is available at the house battery, and will return to a minimal-draw sleep state when the house bank's voltage drops below 13 volts.

While each method of merging and isolating battery banks has its positive and negative aspects, we suggest using the method that allows you to keep the system as simple and trouble-free as possible.

Should I break my house batteries up into two banks?

There are conflicting opinions regarding the practice of breaking up your house bank into two parts. Some suggest that the practice guarantees that you'll have at least some battery reserve even if a bad battery drags down the rest of the batteries in one of the banks.

At the same time, there is ample evidence that this practice can reduce the overall life of both banks, as there is a much greater likelihood that the two smaller banks are much more likely to see deeper discharges than batteries kept in a single larger bank. It's really amazing to see the difference in the number of cycles (the number of times you can

discharge a battery to a specific percentage of its capacity before the end of the battery's useful life) you can expect out of a battery if you discharge it to 70% of its capacity compared to 50% of its capacity. The difference in its effect on the battery is phenomenal. Unless there is a substantial concern for redundancy, we would recommend you stick with a single house bank.

Do I need a case-ground or an isolated-ground alternator?

In most marine applications, the engine block becomes an integral part of the vessel's grounding system – in which case, the case of the alternator will also become a part of the system ground. As such, it makes perfect sense to allow the alternator mount to be the conductor on the negative side of the system.

At the same time, when the alternator case becomes the primary contact point for your charging system's connection to ground, that connection can be compromised by coolants and lubricants in the engine block.

We feel that the quality of our alternator's ground will have a profound effect on the performance of the entire DC charging system. As a result, all Balmar high-output alternators. with the exception of our 7-Series alternators, feature isolated grounding terminals. When installing an isolated ground alternator, it is essential that the grounding cable to the alternator must be of equal size as the positive output cable.