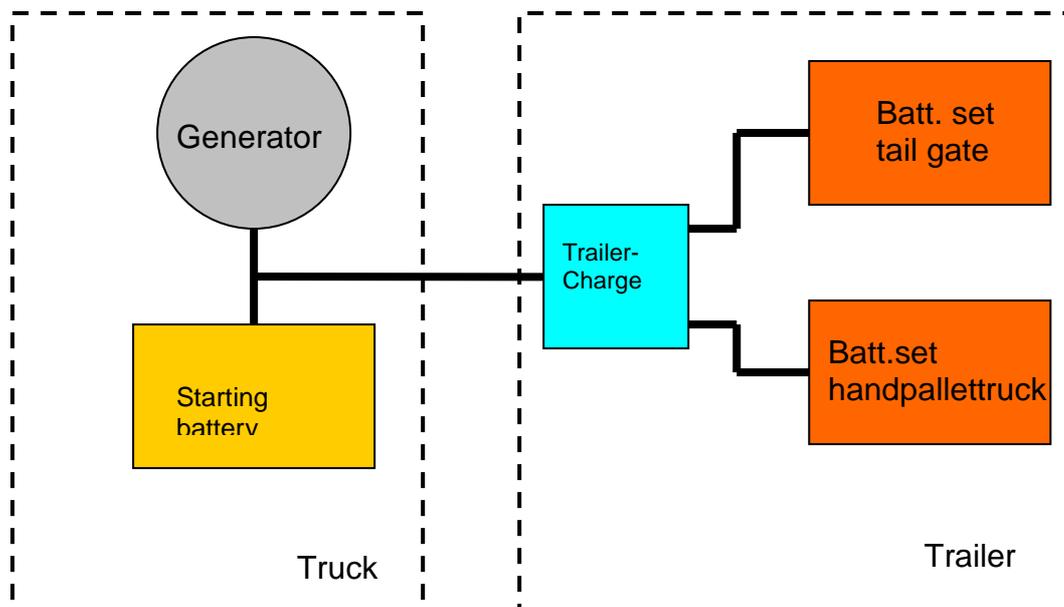


Power distribution trailer and truck

1. Introduction.

If a trailer is equipped with a Trailer Charge Loading System, you would expect, that the alternator of the diesel engine could be severely loaded and even burn out. This article describes, how the various components cooperate together and why overloading of the generator need not to be expected.

2. The various components



The generator remains always connected to the starting-battery of the truck. As soon as the diesel engine has been started, the starting-battery is being recharged. The charging-current depends of the number of revolutions of the diesel engine, the age of the starting-battery and how much energy was needed to start the diesel engine. If the starting-battery is reasonably empty, it's own voltage will be relatively low. Theoretically a high current could start running. Also if the battery is completely empty, the charging-current will never increase above a maximum admissible value. This is caused by the electric qualities of the alternator and the charging characteristics of the starting battery. We shall explain this more explicitly.

3. De alternator.

“Lundell” alternators are being applied to all fuel engines, called after the designer. These generators have an integrated electronic regulator with which the voltage and current is regulated. The regulator sees to it, that the generator has a so called falling characteristic. This means, that the voltage goes down, as the current increases.

We make use of this quality to charge the battery correctly.

4. The starting-batteries

Starting batteries consist of lead plates and sulfuric acid. On the moment of unloading the voltage remains relatively equal. If with a 24 V. set of batteries the voltage has gone down to 20 volt, the batteries will be empty for more than 80%. If we would continue with unloading, the voltage will quickly continue to go down, up to the moment that there will be no voltage anymore, nor any current.. This situation always has to be prevented. If a battery once was empty completely, the capacity will be considerably lower and the remaining live will be much shorter. On the moment of loading, the situation will be a little different. If we connect a voltage source (generator or charger) than the current will not start running until the created voltage will be higher than the voltage of the battery itself. The higher the difference between the created voltage and the voltage of the batteries themselves, the higher the charging-current is. A difference between charging voltage of approx. 2 V. causes already a maximum admissible charging-current. If the charging-voltage is getting to high, the battery will start producing gas. The consequence is a loss of water and finally the battery will cook dry. For starting-batteries in a 24 V. system, the maximum admissible voltage is approx. 29,6 V. Above this, the gas production will increase considerably.

5. Alternator and starting-battery.

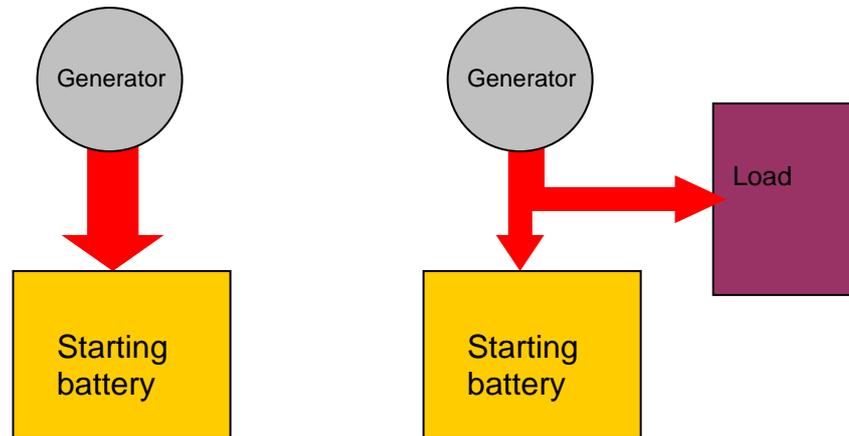
If an alternator will be connected to an empty battery, then the power of the battery itself is relatively low. This means that a very high charging-current could start running. To high for the alternator and to high for the battery. The alternator has fortunately a falling characteristic, due to which in case of an increasing current, the power will go down. Due to this, the difference in current, between the current of the batteries themselves and the current-power will go down. The consequence: The charging-current will be limited on an acceptable value. An equilibrium will be formed.

After some time, if the batteries are getting full, the current will reach a value on which the electronics of the generator will limit the current. The current will go down further.

6. Loading and charging.

If we would activate a load, as described under Point 5, you would expect, that the generator would have to supply more current. This is only true for a part. More current is demanded, the current of the generator goes down, so the charging-current of the batteries will also go down. (The difference in voltage between the power of the batteries themselves and the charging-current will disappear, and therefore the charging-current will go down.

Simply said, the charging-current will go down on the moment of activating a user, in such a way that the generator-power remains about equal.



7. Trailer-Charge.

Trailer-Charge is for the generator of a truck a load which will be activated as soon as the diesel engine runs and the generator gives power.

Suppose, we have adjusted both charging-circuits of the Trailer-Charge 20-20 to the maximum power of 20 A. This means that from every circuit during loading of the batteries of the trailer 20 A. is demanded, independent of the offered voltage. In total, the Trailer-Charge System (two charging-circuits) demands during loading (bulk loading) from the batteries 40 A..

8. Power distribution between starting-batteries and trailer.

Suppose, the diesel has just been started and the starting-batteries are reasonable empty.

The starting-batteries have a relative low power of themselves. A strong charging-current may start running (between 50 and 100 A. depending of the capacity of the alternator and the used batteries)

We know that the current adjusts itself to an acceptable value because the voltage of the generator goes down during increasing current.

If Trailer-Charge will also be activated and the batteries in the trailer are asking the full charging-current, also this energy will have to be supplied by the generator.

More current will start running and the voltage will go down. Trailer-Charge keeps on demanding during full power (40 A) of the generator, independent of the voltage. The starting-batteries demand, however, less current because the charging voltage has gone down.

Conclusion: If the starting-batteries as well as the Trailer-Charge demand the maximum current, first the charging-current to the starting-batteries will be reduced. An equilibrium will be formed in which the disposable power of the alternator is divided between the starting-batteries and Trailer-Charge.

As long as this is demanded by the charging circuits of Trailer-Charge, the current to the Trailer-Charge will remain 40A.

Under normal circumstances the capacity of an alternator is enough to load the starting-batteries of a truck after starting within 10 to 15 minutes. If the trailer is equipped with a Trailer-Charge Loading System, this may take a bit longer, depending of the capacity of the generator.

9. Capacity of the alternator and the needed energy.

Up to now, we have only spoken about the starting-batteries and Trailer-Charge as current-users. In a truck and a trailer there are more current-users. You may think of light, ventilation, air compressors etc, but also an oven, a coffee machine or a magnetron.

These last devices convert electrical energy into heat and use a lot of energy. It is extremely important to calculate, what charge can continuously be demanded from the alternator. On the moment of activating more load than can be supplied by the alternator, the shortage will be taken from the starting-batteries!!! If this is a short lasting situation (f.i. in case of a magnetron) this is not a problem. As soon as the magnetron has been switched off, the starting-batteries will be charged again.

If this is a longer lasting situation, there is a big chance that the starting-batteries will not be charged sufficiently.

In such a case, it is possible to mount an alternator with a bigger capacity. Also the charging circuits of the Trailer-Charge system can be adjusted to a lower charging power.

Regrettably, it is never possible to use more energy (on the long term) as is being supplied.