Ultra-Low Resistance Power Contacts Maximize Efficiency

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Introduction:

We are witnessing a rapid evolution of the space industry and more and more technologies utilized in commercial missions are departing from the strict specifications of legacy scientific missions. It is easy to imagine that 50 to 100 years from now, the cost of escaping the Earth's gravity will be redefined according to the development efforts of our times applied predominantly towards the commercialization aspect of space flight.

Evolution in technology has many facets and it is evident that new technologies must rest on the platforms of existing, mature and proven technology. This does not mean however that the mature technologies cannot improve. If we can take a legacy component, make it lighter or improve its performance in a way that it will improve the efficiency of the system to which it belongs to, we evolve.

The purpose of this presentation is to raise awareness on the impact made by a component as benign as a connector, to the power distribution system efficiency of a small LEO satellite.

Efficiency in an electrical connector:

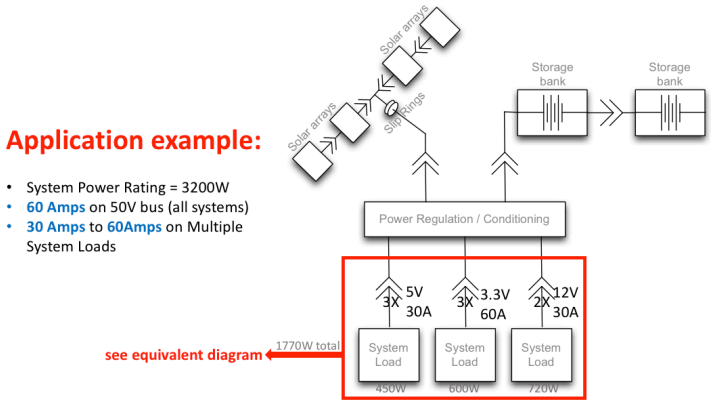
The power efficiency of a connector is inversely proportional to the resistance at the interface between mated contacts. The lower the resistance at the interface, the lower the heat dissipation at the interface and the higher the efficiency of the connection. This is a fundamental functional parameter and this section of the presentation explores three technical elements that could be optimized in order to obtain an ULTRA-LOW Resistance electrical contact.

These three elements are:

1. The coefficient of conductivity of the material
2. Optimization of the surface area of contact
3. Optimization of the force between the areas in contact

Application example:

A simplified diagram of the electrical power distribution system in an LEO telecom satellite is presented and three system loads are selected for the purpose of representing the power losses that take place at the interface of the connections between the source point and the loads.



Different levels of power loss calculations are presented in a comparison table according to the type of contacts selected for the application example.
The presentation continues with a representation of power loss in time. This information is quite revealing leading to conclusive statements for the awareness of the audience.

Conclusion:

Maximizing efficiency in electrical power distribution systems, starts from the component level.