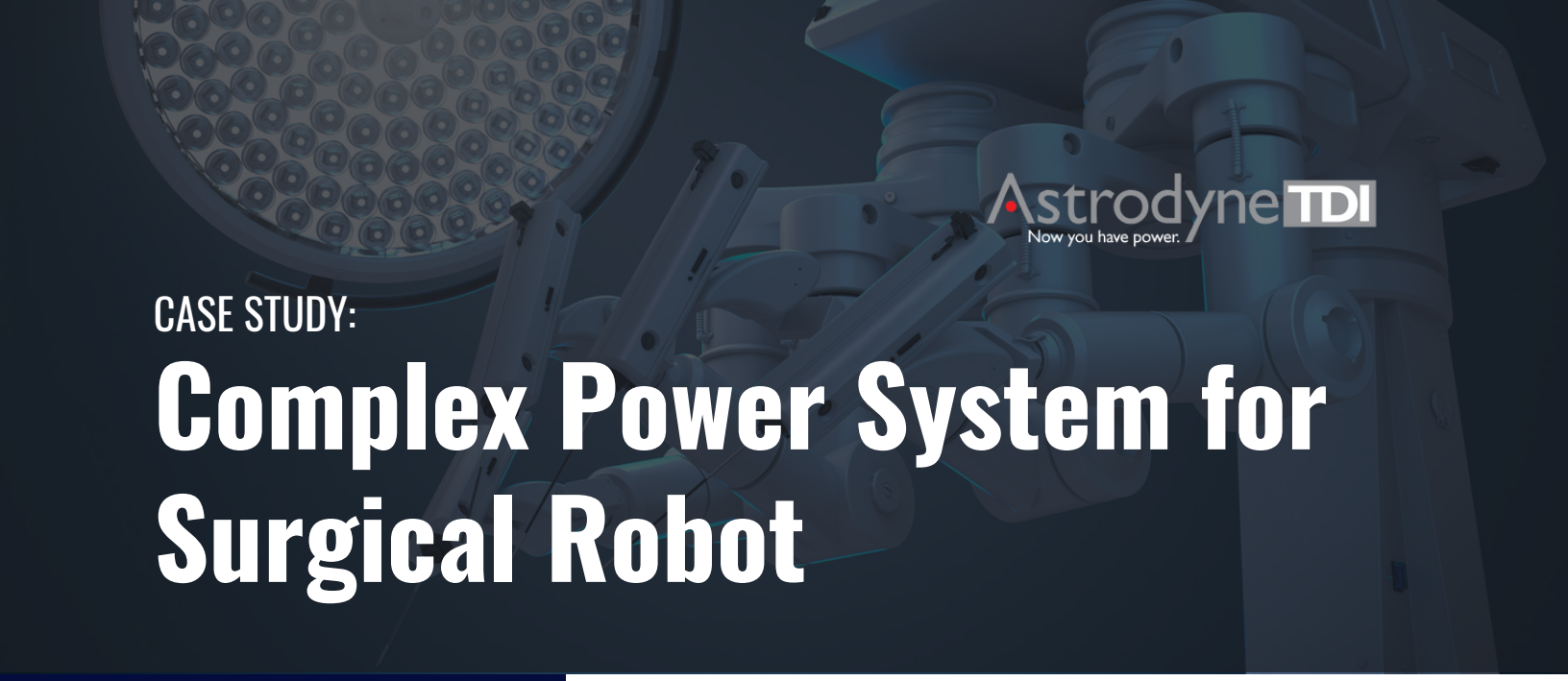


CASE STUDY:

Complex Power System for Surgical Robot

APPLICATION

Healthcare Surgical Robotics

SOLUTION

Power Distribution with Back-Up Power

OPTIMIZATION

Minimized Cost and Internal Resource

OVERVIEW

Robotics and automation are quickly entering the medical industry as surgical assistants. Surgical robots are disrupting multiple aspects of the healthcare industry, allowing doctors to perform various types of complex surgical procedures with improved precision, flexibility, and control. Surgical robots have been widely adopted by many hospitals worldwide. Increased investments in surgical robotics are further expanding its footprint in the medical industry thanks to verified benefits like reduced surgery time, less invasion, and rapid recovery with huge advantages to both the healthcare industry and patients.

POWER CHALLENGES

Surgical suites now include different subsystems like embedded computers, motors, sensors, pumps, cameras, robots arms, etc., which are increasing the power requirements for ORs (Operating Rooms). This surgical robot manufacturer was faced with the challenge of designing a power solution that could provide uninterrupted power to the robot while distributing AC and DC electrical power to multiple auxiliary components.

In addition to the backup generators already in place within hospitals facilities, the surgical robot also required battery backup because even a slight delay or glitch in transition from power sources can cause erratic behavior of the robotic arm which could cause injury to the operator and/or patient. Constant uninterrupted power can ensure that the robotic arm moves to a safe holding position so that the surgeon may take over manually or resume surgery.

These stringent power requirements can create many challenges for design engineers in surgical robotics, including project delays and increased costs. The objective of the design project was to:

- ***Reduce the need for internal engineering resources to improve time to market***
- ***Avoid the need to off-load a high number of parts and components from individual vendors***
- ***Minimize unexpected safety and EMC testing costs that could consume a large part of their budget***
- ***Ensure reliable, safe, and uninterrupted power supply***

ASTRODYNE TDI'S SOLUTION

Astrodyne TDI designed and manufactured a 2U (3.5”) High 19” wide rack mountable online AC PDU (Power Distribution Unit) with battery backup unit utilizing an embedded 123.75 W-hr Lithium Iron (LiFePO4) battery pack that seamlessly integrated within the surgical robot. When utility power is present, two 550W AC-DC power supplies will provide DC power to a pure sine wave inverter. In the event of an input power failure, the on-board battery will supply power to the same inverter. There is no delay involved while transitioning from AC power to back up power because the PDU/UPS is an on-line device. Output characteristics include (4) AC outputs 120VAC, and (6) DC outputs 22-25VDC and 450W. The unit also features Ethernet/ModBus interface connectivity via RJ45.

RESULTS & BENEFITS

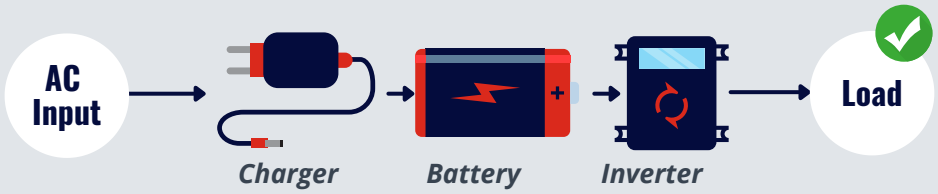
Multiple power outlets including AC and DC power designed and manufactured by Astrodyne TDI

Battery backup power supply design and manufactured by Astrodyne TDI

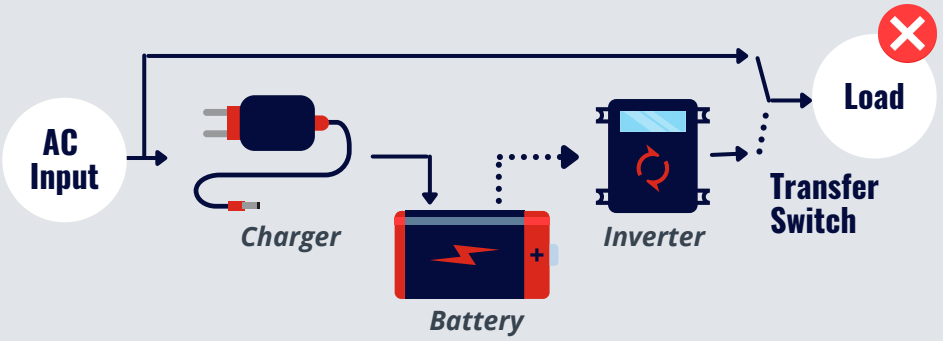
Communication link to interface with the robot through Ethernet connectivity design and manufactured by Astrodyne TDI

Single part number management for power supply, battery backup, EMI Filter, and components.

ASTRODYNE TDI'S ON-LINE UNINTERRUPTED POWER SUPPLY



OFF-LINE UNINTERRUPTED POWER SUPPLY



Normal Mode

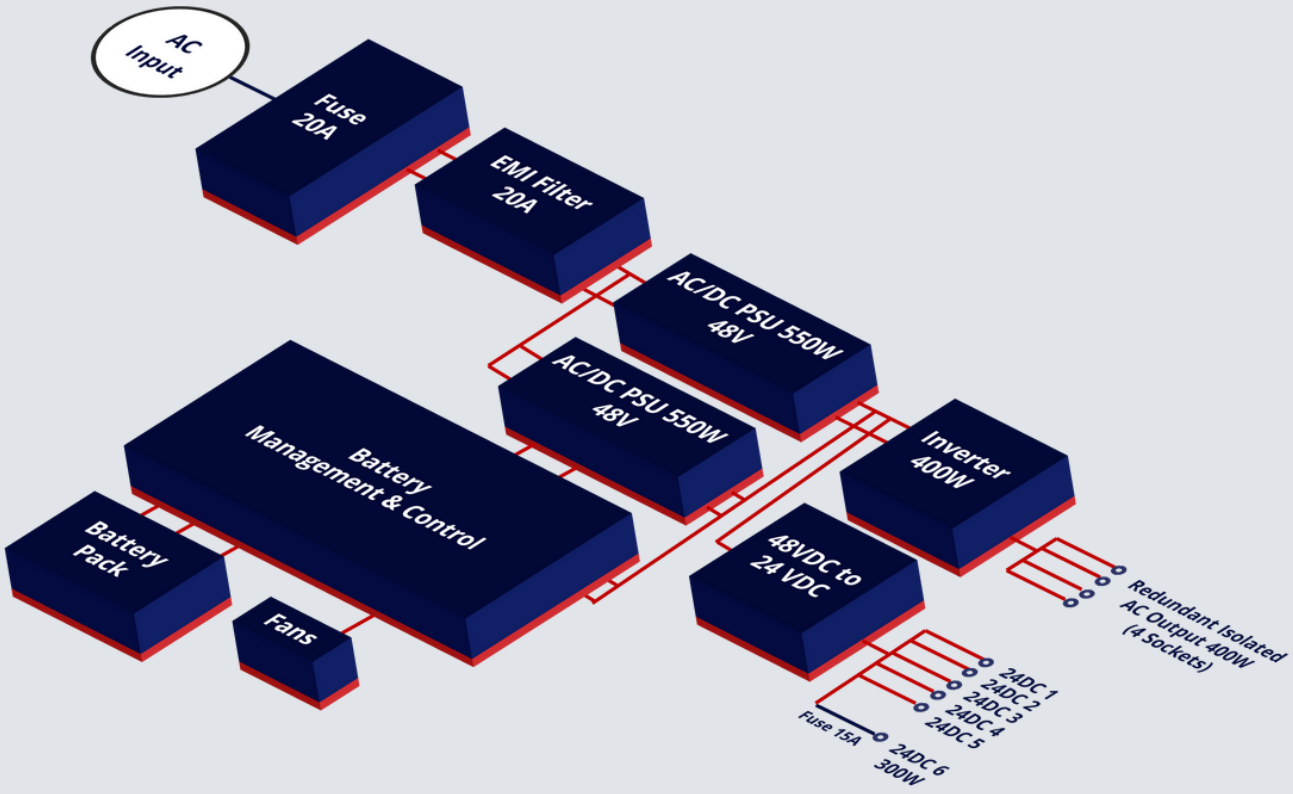
Battery Backup Mode

POWER DISTRIBUTION SYSTEM

Astrodyne TDI leverages its broad capabilities to bridge the gap between value-added integration and power solutions.

EMC & SAFETY COMPLIANCE

Conducted noise on the input and output complies with CISPR11 Class A, FCC Part 15, Subpart J, Class A, and EN55011, class A (Supports EN/IEC60601-1-2 4th Edition). PDU backup power will comply with radiated emissions as measured per CISPR11 Class A, EN55011, class A (Supports EN/IEC60601-1-2 4th Edition). The rectifier meets the following IEC standards without any degradation (Supports IEC60601-1-2 4th Edition)



Developing Power Technologies & Products that People Depend Upon, to Enhance, Protect, and Save Lives.

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