AMPEGON

Company Profile
Ampegon Group

Science MedTech Industry Broadcast

AMPEGON

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1 Introduction

1.1 About us

Ampegon is a new brand established in autumn 2012 to merge the former Thomson Broadcast radio activities and newly acquired companies in one powerful and market leading group. The group consists of Ampegon AG, Turgi (Switzerland), Ampegon Antenna Systems GmbH, Ludwigshafen (Germany) and Ampegon PPT GmbH, Dortmund (Germany) with a representation office in Beijing (China). Ampegon serves the global Science, MedTech, Industry and Broadcast markets with an extensive product range tailored to customer needs in these strategic fields.

The company began transmitter development in 1937. At that time, it was the Transmitter Department of Brown Boveri, which evolved into Asea Brown Boveri (ABB) in 1988, it moved with the Antenna Department to Thomson Group (France) in 1993 and was finally transferred 2011 as Thomson Broadcast to a private investor Parter Capital Group (PCG). In October 2013 Puls-Plasmatechnik (PPT) GmbH joined Ampegon under same ownership. With a strong spirit of innovation from the beginning, the company made a reputation for itself as a true pioneer in the industry. The technological milestones laid have greatly shaped the industry and set high standards worldwide for state-of-the-art design.

1.2 Quality Statement

Providing premium quality products and services, Ampegon has been ISO 9001 certified since 1990. The standard supports efficient management processes and it demonstrates our commitment to quality and continuous improvement.

1.3 Customer Services

Ampegon is a reliable and experienced partner offering a wide range of service products: Spare parts management, troubleshooting support and customized service agreements (SLA's). We aim to deliver complete solutions and pro-active support to maintain the availability and quality of the equipment over its life time.

1.4 Activities Ampegon AG

Situated near Zurich in Turgi (Switzerland), Ampegon AG is a highly specialized company in high power RF engineering. As a leading manufacturer of high power AM/DRM broadcasting transmitters, high power RF amplifiers and regulated high voltage modulators and power supplies (HVPS) for more than 75 years, Ampegon gained an immeasurable amount of experience and know-how in the field of high power RF amplification, power electronics and fast signal processing. Our in-house R&D expertise covers a wide range of disciplines in electrical engineering, from the development phase throughout the complete design and validation phase. Customers include public and private broadcasters as well as renowned laboratories, research institutes and private institutions on all 5 continents and in more than 100 countries.

The company's product range includes

- Shortwave AM/DRM broadcast transmitters 50 kW - 500 kW (tube) and 1.5 kW – 25 kW (solid-state)
- Mediumwave AM/DRM broadcast transmitters 5 - 2000 kW
- Control systems for fully automated radio broadcast centers, including antenna- and network control systems
- Special auxiliary equipment for broadcast applications, such as test loads, RF feeder lines, antenna selector switches, matrix switching systems, power combiners, filters, cooling systems
- Regulated high voltage modulators and power supplies (HVPS) with voltages up to 200 kV and currents up to 2000 A

- High power RF amplifiers
  3 - 30 MHz / up to 2 MW cw (continuous wave) and up to 6 MW pulse
  30 – 120 MHz / 0.05-2MW pulse
  100 - 300 MHz / up to 350 kW cw
  up to 1300 MHz / up to 350 kW pulse

The company consists of a comprehensive R&D section, a manufacturing facility, a project management and an international sales & marketing team, with a permanent staff of around 80 employees.

1.5 Activities Ampegon Antenna Systems GmbH

Ampegon Antenna Systems GmbH is situated in Ludwigshafen, Germany and is highly specialized in the field of high-performance antenna & mast systems for more than 60 years. The core business of the company is the design and development of high-power AM antennas with systems and components. Ampegon high profile engineers are specialized in designing, building, servicing and optimizing antenna systems. Customers are public and private broadcasters on all 5 continents.

The company's product range includes

- Shortwave AM/DRM broadcast antenna systems 50 - 500 kW
- Long- and Mediumwave AM/DRM broadcast antenna systems 10 - 2000 kW
- VLF (very low frequency) applications as well as towers and masts for specific communication needs (TV, FM, Telecom, etc.)

The company consists of a comprehensive R&D section, a project management and an international sales & marketing team, with a permanent staff of around 20 employees.

1.6 Activities Ampegon PPT GmbH

Located in Dortmund (Germany), Ampegon PPT GmbH is a highly specialized company in the field of pulsed power systems for scientific, medical and industrial applications. The excellence of the company is its ability to prototype, produce and commission small series in close cooperation with the customer.

The company's product range includes

- Pulse modulators for the operation of high power microwave tubes
- Pulsed magnet power supplies
- Power supplies for plasma and vacuum arc equipment
- High voltage capacitor charging power supplies for medical applications (e.g. kidney stone disintegrators)
- High voltage/high current solid state switches

The company consists of a comprehensive R&D section, a project management and an international sales & marketing team, with a permanent staff of around 20 employees.

1.7 International Sales & Service Offices

In China, Ampegon is supported by a representation office in Beijing, Ampegon AG Beijing representative office. It is responsible for local services, sales and marketing.

2 Competencies in Broadcast Systems

Ampegon is the leading designer, manufacturer and integrator of radio broadcast systems worldwide. Focusing on developing advanced solutions to meet environmental and technological

evolvements, Ampegon shapes the industry with the most advanced systems for digital transmissions and best performance over the equipment lifetime.

2.1 Experience and Past Performance

Important inventions, innovations and technological steps include	
Development of 1st mediumwave transmitter for Beromünster, Switzerland	1937
Installation of the 264 m mediumwave mast at Mühlacker for the Süddeutscher Rundfunk, at that time the highest guyed mast in Germany	1950
Development of 1st shortwave transmitter	1952
Europe's biggest shortwave antenna system, Wertachtal, Germany	1972
First DCC dynamic carrier control for B-class-modulated AM transmitters	1976
Automatic tuning for shortwave transmitters	1976
Europe's biggest myriametricwave antenna system, Ramsloh, Germany	1978
First fully rotatable shortwave antenna worldwide in Kuwait	1978
Invention of Pulse Step Modulator (PSM) Technology	1982
500 kW shortwave PSM transmitter	1985
Biggest transmitting station worldwide in Abu Dhabi with a mediumwave antenna system, 50 fixed and 2 rotatable shortwave antennas for 500 kW	1985
1 MW PEP on single side band operation (SSB)	1986
First longwave directional antenna with 2 MW transmitting power in Algeria	1986
First antenna combination worldwide with 1 MW transmitting power for shortwave in Jordan	1988
Invention of "Distortion Free" transmitter	1990
10 rotatable shortwave antennas with mode-switching, each capable to provide 500 kW RF for TDF, Issoudun, France	1995
Design and market introduction of low power solid state mediumwave transmitter: M2W Line (5 – 125 kW)	1997
Introduction of the first digital AM Modulator Product Line: Skywave	1997
Founding member of the DRM (Digital Radio Mondiale) Consortium, founded to develop and promote a digital AM standard for the broadcasting bands below 30 MHz	1998
Upgrading of transmitters for the participation in DRM field tests and DRM pilot broadcasting	1999 - 2002
Development of a M2W digital starter kit	2002
Automated DRM shortwave broadcasting	2003
First one-band shortwave antenna with rigid-dipole technology capable to provide 300 kW RF	2006
Extension of power range of M2W Transmitter Line to 200 – 300 kW	2007 - 2008
First rotatable shortwave antenna, HR 2/2	2010
Invention of E-PSM technology	2011
New Activity Green Technologies: Photovoltaic (PV) Plants for Broadcast Sites	2012
Introduction of the new transmitter control system UCS (Universal Control System)	2013
Introduction of enhanced Shortwave Transmitter Product Line with integrated DRM modulator for automatic operation	2014
New Low Power Solid-State Shortwave Transmitter Product Line from 1.5 kW to 25 kW AM carrier power	2015

2.2 Antennas, Towers and Masts

Ampegon offers the most advanced and efficient antenna systems on the market today and is the only supplier in the world for rotatable curtain antennas (RCA). Whether digital or analog, the best signal on air depends on optimal interconnection of all broadcast system components. The Ampegon antenna portfolio includes systems for shortwave, long- and mediumwave, VLF applications as well as tower and masts.

2.3 Shortwave Transmitters

True to its tradition of combining innovative technology with reliable and well proven techniques, Ampegon has developed an enhanced shortwave transmitter line with integrated DRM solutions. The Ampegon shortwave transmitter TSW product line extends from 50 kW to 500 kW and the new low power solid-state shortwave transmitter TSW SSA product line from 1.5 kW to 25 kW.

2.4 Long- and Mediumwave Transmitters

Ampegon cooperates with TRANSRADIO for long- and mediumwave transmitters in order to provide complete system solutions including antennas. With its compact high quality modular design from 5 to 600 kW, the TRAM line leads the market for best performance in analog and digital operation.

2.5 DRM Equipment

As a leading force for digital broadcasting since the beginning, our DRM compatible equipment meets highest standards and customer requirements. Designed to provide end-to-end DRM solutions for broadcasters and network operators, the DRM product line is a perfect fit for all Ampegon transmitters

2.6 Broadcast Control System

From local monitoring to worldwide networking, the Master Series II line manages practically anything from a single transmitter site to a global network. Based on a modular, hierarchical design principle, Master Series II systems avoid a single point of failure and guarantee practically 100 % availability of your broadcast system.

2.7 Auxiliaries

Our auxiliaries are the products of best quality craftsmanship backed by more than a generation of experience in the trade. The choice of Ampegon professional components for your radio broadcasting system is your guarantee for quality, long lifetime and best performance.

3 Competencies in Science, MedTech and Industry

Ampegon designs and delivers high power systems for world-class research facilities. Their experiments are at the absolute cutting edge of scientific research and strive for the limit of technological performance. Such important research projects advance human understanding of materials science, medicine, engineering, biology, particle physics and nuclear fusion.
Ampegon designs and delivers high power RF systems for medical institutions. Our solutions, already deployed in research, are now adopted for high precision therapy products. A new promising therapy technique for cancer is using high energy accelerated particles, ensuring extremely precise treatment.
Ampegon cooperates with industrial partners to implement novel and more efficient processes. Forward thinking commercially-oriented enterprises make use of the technological developments derived from scientific research to improve or increase the efficiency of their industrial processes.

3.1 Experience and Past Performance

Important inventions, innovations and technological steps include	
Invention of Pulse Step Modulator (PSM) Technology	1982
2 MW/30-120 MHz power amplifiers for fusion research	1983
55 kV/100A solid state power supplies in PSM technology	1985
Extension of technological limits towards 130 kV and 100 A for HVPS systems	1999
Development of special RF amplifier systems for medical applications (cancer treatment)	2003- 2006

Development of a digital low level RF system for the most reliable and precise control of amplitude and phase of electromagnetic fields as well as cavity tuning in non-superconducting cavities for particle acceleration	2008 - 2009
Development of flexible, output voltage controlled long pulse modulators for klystrons used to drive for Free Electron Laser Accelerators (XFEL)	2010
Invention of E-PSM technology	2011
Development of long pulse HV modulators for klystrons based on a serial resonant converter topology	2012
Development of high power solid state RF amplifiers and combining systems for single frequency applications	2013
Introduction of new short pulse high power modulators	2014

3.2 High Voltage Power Supplies

Ampegon designs and delivers stand-alone regulated high voltage power supplies for high energy applications in pulsed and CW mode. At the heart of the stand-alone high voltage power supply (HVPS) system is an Ampegon's patented pulse-step modulator (PSM). Since the introduction of PSM technology in the 1980s, this system has been continuously enhanced and improved. One of the major breakthroughs in performance was achieved with the addition of DC/DC convertor on the PSM module. This design has since been refined into our cutting-edge "enhanced" PSM (EPSM) topology. Ampegon HVPS solutions are highly regarded for their flexibility, reliability and high performance. Thanks to the modular design of the basic PSM and improved EPSM technology, power supplies are adaptable to meet practically any customer specification or requirement.

3.3 RF Amplifiers

Ampegon designs and delivers special RF amplifier systems based upon vacuum tubes, klystrons, inductive output tubes (IOTs) and solid-state technology. Our speciality is handling RF power ratings of up to 2 megawatts and frequencies up to 200 MHz with vacuum tubes; up to 500 MHz with solid-state technology, and frequencies up into L-band (1.3 GHz), S-band (3.6 GHz) and C-band (5.7 GHz) in the case of klystron tubes or IOTs. Such amplifier systems typically find applications in various scientific fields, such as particle accelerators and plasma experiments. As experts in the field of high power, high frequency RF, Ampegon offers consultancy for studies, plant engineering and project assignments, as well as specialist in-house design and manufacture. Our engineers can offer customized solutions for a wide range of medical and industrial applications.

3.4 Short Pulse High Power Modulators

Ampegon designs and delivers stand-alone, versatile and compact short pulse modulators for specialist high frequency RF amplifier use amongst other applications. Our short pulse modulator, based on solid-state technology with a pulse forming network (PFN) topology, complements Ampegon's product range for pulsed, high power modulator and RF amplifier systems, as new applications demand shorter, higher frequency pulsed power. Ampegon's short pulse modulators are valued for their high degree of flexibility without compromising on efficiency or reliability. Thanks to the modular design of this newly implemented technology, these systems are adaptable to meet practically any customer specification. The design is optimized for best performance while retaining a small footprint and ensuring reliable operation by using the latest semiconductor technology.

3.5 Long Pulse High Power Modulators

Ampegon designs and delivers stand-alone, versatile and compact long pulse modulators for use with high average power RF amplifiers, amongst other applications. Our long pulse modulator, based upon solid-state technology, complements Ampegon's product range for pulsed, high voltage modulator and RF amplifier systems, as new applications demand high average power

outputs supplied continuously over millisecond timescales. Ampegon's long pulse modulators are known for their high degree of flexibility without compromising on efficiency or reliability. Thanks to the modular design of this newly implemented technology, these systems are adaptable to meet practically any customer specification. The design is optimized for best performance while retaining a small footprint and ensuring reliable operation by using the latest semiconductor technology.

3.6 Digital LLRF Systems

Ampegon designs and delivers universal digital low level RF systems for intuitive control, flexible output and reliable operation. Intelligent digital LLRF systems permit field regulation in RF cavities, feed-forward signal compensation and integrated control of chain amplifiers. They can also serve as the primary human-machine interface (HMI) between an operator and an RF amplifier system as a whole. Therefore, in spite of their potentially complex nature, Ampegon's LLRF system is designed to be intuitive, with straightforward and self-explanatory operation. Additionally, these systems are designed to be robust and reliable, and feature a high degree of automation. One example application for digital LLRF systems is for achieving amplitude and phase control in the RF cavities of particle accelerators. They keep the amplitude tuned to the correct frequency for resonance, regardless how the cavities 'drift', thus ensuring efficient operation and that the particles are continuously accelerated.