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Overview of Circuit Topologies for Inductive Pulsed Power Supplies

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The pulsed power supply is one of the most important components in the electromagnetic launch system. The IPPS (Inductive Pulsed Power Supply) has attracted researchers'attentions with its major advantages of high energy storage density (over capacitive pulsed power supply) and easy control (over rotating mechanical pulsed power supply). Since the circuit topology of the basic IPPS module will directly determine the comprehensive performance of the whole IPPS system, circuit study has been an important focus in the field of IPPS. This paper reviews the present circuit topologies for IPPS, including the XRAM (MARX spelt backwards) with GTO (Gate-Turn-Off thyristor), the XRAM with ICCOS (Inverse Current COmmutation with Semiconductor devices), the XRAM with MFCE (Magnetic Flux Compression Effects), the CMIS (Current Multiplier by Inductive Storage), the STRETCH (Slow TRansfer of Energy Through Capacitive Hybrid) meat grinder, the STRETCH meat grinder with ICCOS, the meat grinder with SECT (SElf-charged Capacitor and Thyristors), and the meat grinder with CPFU (Capacitive Pulse Forming Unit).
To be specific, as for these circuit topologies, historical development timeline and spectrum structure are illustrated; circuit structure and working principles are introduced; module performances including volume, energy storage level, energy storage density, peak output current, energy delivery efficiency, and money cost, are compared; major strengths and weaknesses are summarized.

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