What is a closed Brayton cycle power conversion system?

ABSTRACT A Closed Brayton cycle power conversion system has been developed to support the NASA fission surface power program. The goal is to provide electricity from a small nuclear reactor heat source for surface power production for luna r and Mars environments. The selected media for a heat source is NaK 78 with water as a cooling source.

How efficient is a Brayton cycle power converter?

The power converter system strives to achieve over 18%thermal to electric efficiency. This is a high efficiency for a 12 kWe Brayton Cycle power converter with the specified high and low temperature range. oMinimum complexity

What is a NEP power conversion model with a Brayton cycle?

A NEP (nuclear electric propulsion) power conversion model with a Brayton cycle was created in Simulink in order to parametrically explore the power conversion design space in support of TMP (technology maturation plan) development.

How does a Brayton cycle work?

The Brayton cycle circulates heated working fluid and compresses it,which spins a generator that creates electricity. The unique properties of supercritical sCO2 offer significant advantages over steam as a working fluid in closed and semi-closed cycles.

Is sCO2 Brayton ready for commercial use?

In a significant breakthrough for the development of supercritical carbon dioxide (sCO2) power cycles,the 10-MWe Supercritical Transformational Electric Power (STEP) Demo pilot plant in San Antonio,Texas,has wrapped up Phase 1 testing,demonstrating the commercial readinessof its next-generation indirect sCO2 Brayton cycle.

What is a closed Brayton cycle generator?

The Closed Brayton Cycle power was selected to be 12 kWe output from the generator terminals. A heat source NaK temperature of 850 K +/-25 K was selected. The cold source water was selected at 375 K +/-25

K. A vacuum radiation environment of 200 K is specified for environmental operation.

This report describes the results of a Sandia National Laboratories internally funded research program to study the coupling of nuclear reactors to gas dynamic Brayton power conversion systems. The research focused on developing integrated dynamic system models, fabricating a 10-30 kWe closed loop Brayton cycle, and validating these models by

Two of the contracts are focused on Stirling-cycle machines, and another is pursuing Brayton conversion. The contracts consist of three phases: Design, Fabrication, and Test. The concept takes inspiration from the 1990's Dynamic Isotope Power System (DIPS) concept from Rocketdyne and Allied Signal.

DOI: 10.1016/J.ENCONMAN.2012.01.028 Corpus ID: 93394817; Computational analysis of supercritical CO2 Brayton cycle power conversion system for fusion reactor @article{Halimi2012ComputationalAO, title={Computational analysis of supercritical CO2 Brayton cycle power conversion system for fusion reactor}, author={Burhanuddin Halimi and Kune Yul a?|

BRAYTON POWER CONVERSION SYSTEM

A helium Brayton cycle power conversion system therefore makes the elimination of the intermediate heat transfer loop possible. This paper presents a pre-conceptual design of multiple reheat

The NASA Glenn Research Center ina??house computer model Closed Cycle Engine Program (CCEP) was used to explore the design trade space and offa??design performance characteristics of 100 kWea??class recuperated Closed Brayton Cycle a?|

1. Introduction. Supercritical CO2(s-CO 2) Brayton cycle is a promising power conversion technology, which has advantages like compact system configuration compared to steam generation system, higher efficiency, and less need of water consumption has aroused great interests among industry and academia of different energy types, especially in nuclear a?|

BRAYTON POWER CONVERSION SYSTEM

The Brayton Heat Rejection Subsystem (HRS) must dissipate waste heat generated by the power conversion system due to inefficiencies in the thermal-to-electric conversion process. Sodium potassium (NaK) and H2O are two coolant working fluids that have been investigated in the design of a pumped loop and heat pipe space HRS.

a?cFast reactor systems have a number of significant advantages in future energy markets. a?cNuclear Air-Brayton power conversion systems can adapt to the highly penetrated renewable energy market and present some significant advantages over pure steam systems. a?cNACC and NARC systems may compete well with gas turbine systems

Initial Test Results of a Dual Closeda??Braytona??Cycle Power Conversion System: Johnson, Paul K, and Mason, Lee S. Proceedings of the Space Nuclear Conference: Conference Paper: 2007, December 2: NTRS: Operational Test Results of a 30 kWe Dual Brayton Power Conversion System: Johnson, Paul K., Weaver, Hal F.

BRAYTON POWER CONVERSION SYSTEM

The exhaust temperature of molten carbonate fuel cells (MCFCs) and solid oxide fuel cells (SOFCs) is 620a??660 ?C and 800a??1000 ?C, respectively, which can be utilized as a heat source for other power conversion systems. Air Brayton cycle and SCBC were used to make a comparative analysis of the efficiency when being applied to MCFC [52]. The

Besides Brayton cycle and other P-V-T cycles, general energy conversion systems can always be decomposed or transformed into the cycle process as shown in Fig. 5, in which process 1-2 and process

The supercritical Brayton cycle power conversion system turns out to be a prevailing option from the thermal efficiency point of view. It is expected that the Brayton cycle has higher cycle efficiency than the commercial Rankine cycle [5]. Further, the volume of the whole cycle is expected to shrink by adoption of a supercritical fluid which

BRAYTON POWER CONVERSION SYSTEM

In this paper, the Chinese Fusion Engineering Testing Reactor (CFETR) power conversion system, with a supercritical CO_2 (SCO_2) Brayton cycle, is designed, analyzed and optimized nsidering the pulse operation of the reactor, a heat storage loop with high temperature molten salt and low temperature concrete is introduced.

The Brayton cycle, also known as the Joule cycle, is a thermodynamic cycle that describes the operation of certain heat engines that have air or some other gas as their working fluid is characterized by isentropic compression and expansion, and isobaric heat addition and rejection, though practical engines have adiabatic rather than isentropic steps.

However, in the previous paper written by the authors (Yoon et al., 2012), it was demonstrated that even with a water-cooled Small Modular Reactor (SMR), the S-CO_2 Brayton cycle can be adopted as its power conversion system and harnesses its advantages.Due to smaller plant generation capacity of SMR, which is usually below 300 MWe, the total system a?|

BRAYTON POWER CONVERSION SYSTEM

Supercritical carbon dioxide (S-CO 2) Brayton cycle has many advantages including high power conversion efficiency at mediate temperature, compact configuration, high system simplicity and low efficiency loss using dry cooling, which make it well suited to nuclear reactor applications.S-CO 2 power cycle can be used as power conversion system for almost all the a?|

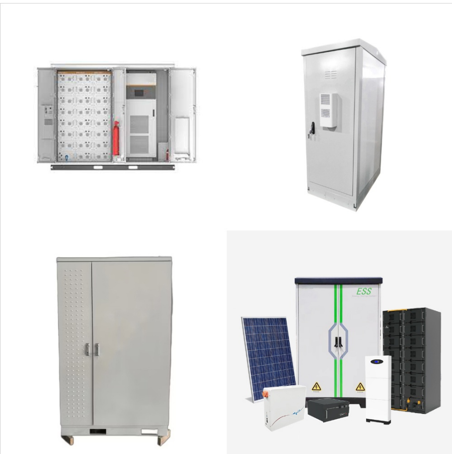
This paper describes potential heat rejection design concepts for Brayton power conversion systems. Brayton conversion systems are currently under study by NASA for Nuclear Electric Propulsion (NEP) and surface power applications. The Brayton Heat Rejection Subsystem (HRS) must dissipate waste heat generated by the power conversion system due

The Brayton cycle power conversion system is ideally suited for coupling to an isotope heat source. From availability considerations, it is necessary to minimize the amount of isotope required for the power system. The high efficiency of the recuperated Brayton cycle, at temperatures compatible with high-temperature isotope fuel forms, makes it

BRAYTON POWER CONVERSION SYSTEM

SOLAR

SED-Brayton-cycle (CBC) power conversion is one method that can be used in space power systems. rayton system conceptual designs for milliwatt to megawatt power converters have been developed nstoss and Ashe 1, Harty, et al. 2, Shaltens and Mason 3, Hyder et al. 4, Mason 5).



Abstract This paper presents an overview and a few point designs for multiple-reheat helium Brayton cycle power conversion systems using molten salts (or liquid metals or direct helium cooling). All designs are derived from the General Atomics GT-MHR power conversion unit (PCU). The important role of compact, offset fin heat exchangers for heat a?|

The dual Brayton power conversion system constructed for NASA Glenn Research Center (GRC) was acceptance tested April 2007 at Barber-Nichols, Inc., Arvada, Colorado. This uniquely configured conversion system is built around two modified commercial Capstone C30 microturbines and employs two closed-Brayton-cycle (CBC) converters sharing a

BRAYTON POWER CONVERSION SYSTEM

The advantages of dynamic Brayton power conversion include high efficiency, long life, and scalability to high power (Ref. 7). For these reasons, NEP dynamic power (BRU) project (1968-1978) was aimed at a high-efficiency power conversion system for isotope, reactor, and solar receiver heat sources (Ref. 8). It was designed for operation

Experimental and Analytical Performance of a Dual Brayton Power Conversion System NASA/TM-2009-215511 19. NASA GRC a?c RESEARCH AND ENGINEERING DIRECTORATE Direct Drive Gas a??Brayton Test (2009) Brayton Power Conversion Unit NASA/TM-2010-215843 20. NASA GRC a?c RESEARCH AND ENGINEERING DIRECTORATE 12 kWe Brayton Power a?|

DBPCS=Dual Brayton Power Conversion System; CCSS=Closed Cycle System Simulation Pre-Decisional, For Discussion Purposes Only 15 . National Aeronautics and Space Administration Fission Surface Power Concept a?c Modular 40 kWe System with 8-Year Design Life suitable for (Global)