SPACE

ESPSS - European Space Propulsion System Simulation

Toolkit for modelling rocket and satellite propulsion systems

Applications

Simulation of ground, spacecraft and launch vehicle propulsion systems under transient and steady conditions

Propulsion system with two-fluid mixtures under gas, liquid and two-phase flow regimes for a wide database of working

Studies of water hammer, pressure drop, priming processes, etc. in fluid networks

Hydraulic and pneumatic systems, equipment and combustors, with heat transfer and controls loops coupled together

Transient simulation of liquid, solid and hybrid rocket engines

Simulation of ramjet engines

Orbital and attitude motion of satellites.

Performance analysis and design of space engines

Electrical propulsion systems

Modeling of combustors, heat-exchangers, turbo-machinery, pumps, tanks, etc.

ECLSS - Environmental Control and Life Support Systems in manned spacecraft.

Modelling of environmental control and life support systems in manned spacecraft.

Applications

Thermohydraulic analysis of conventional ECLSS systems of air regeneration and conditioning in spacecraft

Thermohydraulic analysis of venting lines

Sizing or specification of conventional ECLSS equipment pressure regulators, valves, heat exchangers, pumps, fans, etc.

Identification of operational problems in ECLSS systems

Transient analysis of ECLSS system performances for the duration of the mission

Analysis of air humidity, temperature and composition taking into account occupation and crew member activity.

Thermohydraulic analysis of cooling loops in conventional ECLSS systems.

Analysis of the response of the ECLSS systems control system and adjustment of the control loops.

Calculation of pressure drops in ducts and accessories in air loops and cooling loops of ECLSS systems

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SPACE

TPCS - Two-Phase Capillary pumped Systems

Simulation of Loop Heat Pipes (LHP) and Capillary Pumped Loops (CPL) in two phases

Applications

Transient simulation of two-phase capillary pumped systems.

Simulation of single or multi evaporator loops

Reverse flow and transitions between flooded, two-phase, dry-out and standby conditions

SPACE-POWER

FLUIDAPRO - Fluids simulation

Model and simulate complex dynamic fluid network in one/two phases (liquid-vapor)

Applications

Transient simulation of complex fluid systems, power plant cycles and combustion processes

Simulation of models involving two-fluid mixtures under gas, liquid and two-phase flow regimes for a wide database of working fluids

Simulation of water-hammer, pressure drop, priming processes, etc. in fluid networks

Analysis of hydraulic and pneumatic systems, equipment and combustors, with heat transfer and controls loops coupled together

Modeling of combustors, HX, turbo-machinery, Pumps, Tanks, Boilers, hydraulic and pneumatic actuators, etc.

Performance analysis and optimization of space and aeronautical engines

POWER

SMART_GRID - Energy SMART GRID simulation

Modelling of energy systems with sources such as wind turbines, solar, battery banks and diesel

Applications

Intelligent networks of different sources (e.g. wind, solar, etc.) in which the energy demand and production are dynamically studied.

Study how environmental conditions affect renewable energy sources (sun, wind)

Analysis of different network control configurations

Network optimization

Analysis of different network configurations

POWER

POWER

CRYOLIB- CRYOgenic simulation LIBrary

PPTS - Power Plant Transient Simulation

Simulating cryogenic installations and their control systems.

Modelling systems of a power plant for fossil-fired (Combined Gas Cycle and Coal), nuclear

(secondary side), thermosolar and hybrid, and advanced generation (Coal Oxy-combustion).

Applications

Applications

Dynamic simulation of large scale cryogenic systems (refrigerators and cryogenic consumers) and their control.

Support for equipment sizing and compatibility of power plant components and systems

System design and integration studies of the cryogenic system

Determination of actuator operating speed requirements: valves, pumps and fans

Development/optimization and off-line test of control algorithms for these systems

Facilitate knowledge of the plant response in open-loop for defining the plant control concept

Check of starting/ending sequences and operation of the system as a whole

Check control logics before implementation ("virtual commissioning")

Virtual commissioning

Preliminary adjustment of controllers (gains, integration times,...)

Operator training in abnormal situations that may occur in cryogenic installations

Analysis of Operational Transients of the plant (load switching, changes of operation mode, pump, turbine trips, ...)

Support for plant testing and start-up activities to facilitate problem identification and troubleshooting

POWER

Engineering simulator to support the plant operation activities of the operation engineers

TRITIUM- Cryogenic simulation

Simulation of processes involving hydrogen isotopes

POWER

Applications

ELECTRICAL_SYSTEMS - Electrical Simulation

Transient analysis of the tritium inventory: concentration of tritium at different process locations

Modelling of electrical components, machines and networks.

Support of decision-taking for process engineering

Applications

Support with deciding on the materials to be used

Modelling transient of electrical circuits

Analysis of tritium transfer surface phenomena

Modelling of power systems

Dynamic analysis of tritium inventory under conditions of no tritium generation.

Development of power electronics systems.

Modeling of different scenarios of pulsed generation of tritium

Transient analysis of load centers

Simulation of changes in the composition of the process fluid

Dynamic analysis of electromechanical systems (maximum loads, energy consumptions, stability limits...)

Check of the behavior of protections (circuit breakers) in electrical networks

POWER

PIPELIQ- Steady Hydraulic Simulation

POWER

Balances of pressures and mass flows of hydraulic/liquid systems

PIPELIQTRAN- Transient Hydraulic Simulation

Applications

Simulation of liquid pipe networks linked with controlled devices like valves, pumps, tanks, etc.

Calculating pressure drops in piping networks

Applications

Calculation of hydraulic balances (pressure and mass flow) in hydraulic systems

Thermo-hydraulic analysis including water hammer and pressure wave phenomena in non-compressible systems

Support in the sizing and selection of equipment (pumps, valves, pipes, etc.).

Evaluating the effect of pressure increase due to bubble collapse

Heat balances in non-compressible circuits

Dimensioning and optimization of pipe networks

Operation and control systems of non-compressible circuits: cooling loops and heat pipes with no phase change.

PIPELIQTRAN- Transient Hydraulic Simulation (continuation)

Selection of pumping systems

Dimensioning and location of anti-waterhammer device

Selection of control valves and actuators

Design and adjustment of control loops for non-compressible systems

Analysis of pressure transients and calculation of wave forces in pipelines for support design

Cooling loops such as the circulating water system of a power plant (nuclear, combined cycle).

Water supply system to a steam generator of a nuclear power plant.

Thermal liquid loops such as the primary circuit of a thermo-solar plant.

POWER

THERMAL_BALANCE- Steady THERMAL BALANCE simulation Toolkit

Steady-state thermal balance studies in power plants

Applications

Stead-state energy balances in different operating conditions in power generation plants (Combined Cycles, Nuclear, etc.)

Identification of causes of loss of performance in power plants

Cycle optimization and operating modes

Study of the impact of modifications and anomalies on plant performance

Transient analysis of the heat sink of a nuclear power plant.

Analysis of the operating sequence in steam accumulators of a thermo-solar plant

Dynamic simulation of the plant and plant systems due to changes in operating conditions or environmental conditions

AERONAUTICS

TURBO - Gas Turbines Performance Simulation

Simulation of design, off-design, transient and mission models in gas turbines

Applications

On-design analysis of aeronautical or industrial gas turbine systems

Off-Design analysis of aeronautical or industrial gas turbine systems

Gas turbines: model identification

Exporting of gas turbine models as flexible stand-alone black boxes (customer decks)

APU modeling

Coupled simulation of engine and aircraft systems

Gas turbine Multi Design Point with limiters

Off-design simulation with limiters

Transient simulation of gas turbines

Transient simulation with control system

New aeronautical engine configuration: Open Rotor, Ultra-High Efficiency Gas Turbine, etc.

ASYST - Aircraft Systems Simulation Toolkit

Simulation of thermo-fluid aeronautical systems (eg. ECS, Fuel, oil, cooling vapor cycles, thermal,etc.)

Applications

Cycle analysis (On- and Off-design) of aircraft thermofluid systems: humid air, liquid and vapor systems

Environmental Control System of an aircraft

Air Cycle Machine based Environmental Control System (ECS)

Vapor Cycle based ECS

Aircraft hydraulic systems (fuel, oil)

Aircraft systems thermal management

Organic Rankine Cycles; combined cycles, heat recovery

Coupled simulation of engine and relevant aircraft systems

ECS engine bleed subsystem

Cabin and air distribution subsystem simulation (ECS)