White Paper

ESDU Design Methods for Nuclear Engineers

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INTRODUCTION

The nuclear renaissance is spawning renewed interest in finding the most efficient, reliable and effective ways to build, operate, and eventually decommission environmentally safe nuclear facilities. Because of this, there is increasing pressure on nuclear engineers to address issues related to thermo-hydraulics, structural and mechanical design, ventilation systems, noise suppression and environmental impact within the targets set by the latest international standards and codes.

The types of projects nuclear engineers typically focus on, such as product design and certification, research and development, product evaluation, equipment selection, product optimization, and validation and benchmarking of computational methods, are all under the microscope. Yet at the same time, the push to bring new nuclear facilities online means engineers need to continually look for ways to increase design process efficiencies to reduce time to market.

A typical engineering design process—whether for a nuclear facility or other type of project—goes through three stages: conceptualization, preliminary and detailed design, and testing and production. The earlier part of the process is critical, as the decisions made at this point can have a significant impact on the overall length and cost of the project.

"Problems found in the later stages of a project can be very expensive, so it's vital that the design is done correctly the first time," said an ESDU engineer, head of Fluid Mechanics - Internal Flow.

CRITICAL VALUE OF DESIGN

Nuclear engineers need to carefully consider the data and methods they employ. Whether they are based on manuals, technical publications or testing, are experimental, developed in-house or engineering software commercially available, the data and methods used can make a considerable impact on the success of a project.

According to ESDU engineers, not all engineering data and design methods are created equal. "Some of these methods are high-cost and time-consuming. Others are of questionable validity," they pointed out.

What engineers need are methods that let them reduce testing and modeling time to obtain optimal engineering solutions quickly, accurately and confidently. Tapping into industry best practices, using benchmarks for model validation to streamline computational fluid dynamics (CFD) and finite element analysis (FEA) modeling time, and reducing the time needed for certification allows engineers to rapidly and accurately solve complicated engineering problems.

MEETING CRITICAL NEEDS OF THE DESIGN PHASE

Designed for engineers by engineers, ESDU data and design methods can help all types of engineers, including those in the nuclear industry, fulfill these needs. ESDU offers a collection of industry-standard engineering data and design methods and software for a wide range of engineering disciplines.

Each ESDU design method has been validated by independent technical committees made up of subject matter experts drawn from the Aerospace and Defense and Process Engineering industries, various research organizations, and academia.

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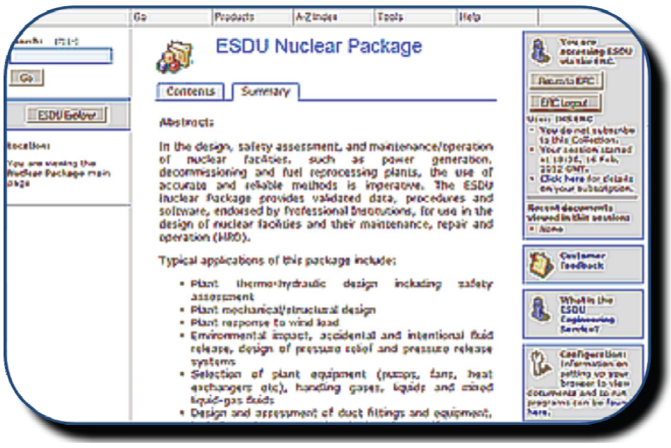
Among the many ESDU data and design method offerings is its nuclear package. The ESDU Nuclear Package provides support for a number of nuclear engineering considerations, including fluid mechanics and internal flow, heat transfer, stress and strength, metallic material properties, wind load, physical data, mechanisms, tribology, noise suppression, and vibration and acoustic fatigue.

"ESDU methods have been used to design many critical components in nuclear facilities for a number of years now," said ESDU engineers. They went on to explain the various functions ESDU methods support: nuclear site management and operations, nuclear design services, nuclear decommissioning and waste management, and radiological services and nuclear security.

The ESDU nuclear package has been organized into four segments: nuclear plant thermo-hydraulic design, nuclear plant mechanical design, nuclear building/environmental impact and nuclear ventilation systems.

Each segment contains validated design methods and software. Customers use the ESDU nuclear package for a wide range of engineering projects, such as evaluating a nuclear plant's response to wind load, selecting the appropriate plant equipment for handling gases and fluids, designing and assessing ventilation systems and duct fittings and equipment, analyzing transient effects in pipelines, and receiving guidance on CFD modeling.



ESDU Engineers continue to work on new design methods and software for nuclear engineers. For example, one method under development offers guidance on calculating the background information for the physical properties governing fluid mechanics, thermodynamics and mechanical engineering involved in accidental or intentional fluid release situations.

"We have used ESDU data and design methods for the past 25 years," said an ESDU customer in the nuclear industry. "We have found benefits from using this information to support design and safety functions in the company. This is because the methods are continuously reviewed and updated and this gives us confidence that we are using the most up-to-date methods and that we are using validated data. This is particularly important when we make license submissions to regulatory bodies."

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