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Library of graphic symbols for power equipment in the scalable vector graphics format

A.G. Yuferov

Obninsk Institute for Nuclear Power Engineering, NRNU MEPhI, 1 Studgorodok, Obninsk, Kaluga Region 249040, Russia

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Abstract

This paper describes the results of developing and using a library of graphic symbols for components of power equipment under the state standards GOST 21.403-80 "Power Equipment" and GOST 2.789-74 "Heat Exchangers". The library is implemented in the SVG (Scalable Vector Graphics) format. The obtained solutions are in line with the well-known studies on creating libraries of parametrical fragments of symbols for elements of diagrams and drawings in design systems for various industrial applications. The SVG format is intended for use in web applications, so the creation of SVG codes for power equipment under GOST 21.403-80 and GOST 2.789-74 is an essential stage in the development of web programs for the thermodynamic optimization of power plants. One of the major arguments in favor of the SVG format is that it can be integrated with codes. So, in process control systems developed based on a web platform, scalable vector graphics provides for a dynamic user interface, functionality of mimic panels and changeability of their components depending on the availability and status of equipment. An important reason for the acquisition and use of the SVG format is also that it is becoming the basis (recommended for the time being, and mandatory in future) for electronic document management in the sphere of design documentation as part of international efforts to standardize and harmonize data exchange formats. In a specific context, the effectiveness of the SVG format for the power equipment arrangement has been shown. The library is intended for solution of specific production problems involving an analysis of the power plant thermal circuits and in training of power engineering students. The library and related materials are publicly available through the Internet. A number of proposals on the future evolution of the library have been formulated.

Keywords: CAD; Power equipment; Scalable vector graphics; SVG; Data exchange.

Introduction

Nowadays, the evolution of computer-aided design systems follows a "text+code" paradigm, which suggests textual representation of drawings and its integration with codes for design computations. Such approach eliminates a great deal of bottlenecks resulting both from the conventional paper-based technology for the handling of design documentation, and from computerization of design activities [1]. This also offers a number of opportunities:

– handling of a drawing as of a database containing graphic, numerical and textual elements;
– validity, consistency and verifiability of design documentation through the application of verification software to the drawing database;
– adaptability of drawings, repeated use thereof and management of the libraries of drawings (this minimizes the labor input in drafting, provides for the integrity of documentation, and simplifies its support and modification);
– parameterization, scaling, automatic display of dimensions and design parameters (weights, volumes, etc.) on the drawing using, for instance, DOM (*Document Object Model*), a standard open technology;
– unification of mimic panels and drafting graphic elements, automatic generation of installation diagrams based on schematics, etc.;

E-mail address: anatoliy.yuferov@mail.ru.
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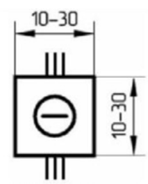
– automatic generation or updating of design documentation based on results of optimization design analyses;
– support, as part of a unified technology and a unified language environment, of all product description levels at all stages of the product lifecycle (schematic, assembly drawing, installation drawing), as well as of all types of design and operating documentation using, for instance, GOST R ISO 10303 standards (STEP or *STandard for Exchange of Product model data*), which include the EXPRESS object-oriented language implementing the EDI/XML (*Electronic Data Interchange/ Extensible Markup Language*) technology for the product model description at different stages of the product lifecycle;
– use of a dynamic graphic interface in automatic process control systems, functionalization of mimic panels, and modification of the composition (configuration) thereof depending on the availability and status of equipment components.

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style="fill:none; stroke: blue; stroke-width:.05cm; font-
family:Arial;">
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Reactor with the designation number of loops </text>
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<line id="L1" y1="5cm" x1="5.75cm"y2="4cm" x2="5.75cm"/>
<line id="L2" y1="5cm" x1="6cm" y2="4cm" x2="6cm" />
<line id="L3" y1="5cm" x1="6.25cm" y2="4cm"x2="6.25cm"/>
<line id="L4" y1="7cm" x1="5.75cm" y2="8cm" x2="5.75cm"/>
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<line id="L6" y1="7cm" x1="6.25cm" y2="8cm" x2="6.25cm"/>
<circle cx="6cm" cy="6cm" r="0.5cm"/>
<line id="svg_6" y1="6cm" x1="5.6cm" y2="6cm" x2="6.4cm"/>
<rect x=".01cm" y=".01cm" width="19.98cm"height="10.98cm"/>
</svg>
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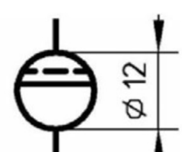
Fig. 1. A reactor with designation of the number of loops.

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height="10.98cm"/>
</svg>
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Fig. 2. A separator of an RBMK reactor.