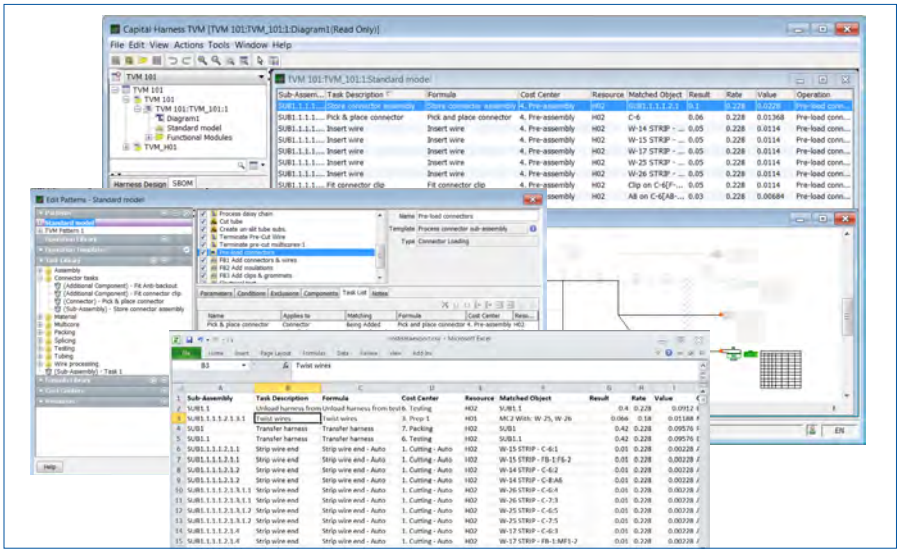
Electrical Systems Design and
Wire Harness Engineering

Capital Harness TVM

D A T A S H E E T



Capital Harness TVM – Rapid, accurate process planning and harness cost estimation

MAJOR PRODUCT FEATURES:

- Create multi-level, structured BOMs from automated processing of harness design data from Capital or VeSys
- Generate rapid and accurate labor and material cost estimates from detailed sub-assembly task analysis
- Optimize cost and resource allocation across multiple manufacturing sites
- Minimize part/sub-assembly manufacturing duplication via automated detection of common sub-assemblies across multiple harness orders
- Capture and apply best-practice process planning knowledge to manufacturing process planning & cost estimation tasks
- Automate the generation of sub-assembly part-numbers for feeding ERP systems

Product Overview

Capital Harness TVM enables costing & process planning engineers to rapidly and accurately synthesize harness build processes & tasks, costs, manufacturing times, and more, from a harness design created by Capital HarnessXC, Capital ModularXC, or VeSys 2.0 Harness.

Unlike traditional approaches that rely on approximation, labor-intensive & detailed expert analysis, proprietary hard-coded applications, and slow error-prone processes, Capital Harness TVM provides a formal framework and process for the rapid generation of accurate time and labor costing.

Capital Harness TVM is designed to support both OEMs and Harness Suppliers with specific functionality designed to help the individual engineering tasks: OEM cost controllers, OEM architects and designers, Supplier sales/quotation engineers, Supplier industrial engineers, and Supplier value engineers.

Patterns, Operations and Tasks

Patterns Operations and Tasks are the foundation of the Capital Harness TVM processing capability. These are typically defined by a process engineering expert during the initial deployment phase and capture best practice manufacturing methods and cost standards which can be consistently and reliably applied by all process/costing engineers across the organization.

Operations drive the generation of the multi-level, structured bill of material (SBOM), which defines the entire manufacturing process as a "tree" of parts and sub-assemblies – also known as the "engineering BOM", "manufacturing BOM", "process tree", and so on. A variety of Operations are defined for each stage of the manufacturing process. Each Operation is designed to identify, select and process its respective target parts and sub-assemblies. Operations can be fine-tuned through a variety of controls including specialization parameters, conditional applicability, component applicability and additional components required, such as packaging.

Operations are further defined to include a sequence of Tasks that model the detailed tasks taking place in the creation of the sub-assemblies generated by the Operations. Each Task has associated formulas that drive the calculation of time and cost results. An example of a typical Operation might be "Cut Strip & Terminate Wires – 18-24" – this Operation might be defined to operate on 18-24AWG wires up to 3000mm in length; it will comprise a series of Tasks, each with

their own cost formula – for example, Cut wire, Apply strip, Fit terminal, Unload. The manufacturing engineer would use this as a basis for creating additional wire processing operations, each specialized for different wire sizes and machine capabilities.

Operations are assembled into procedural sequences, starting with wire operations and ending with final assembly operations. An Operation sequence is called a "Pattern" and a process engineer can define multiple patterns if needed – e.g. for different factories. Libraries are provided to store each of the customized Operations, Tasks, Formulas and Patterns.

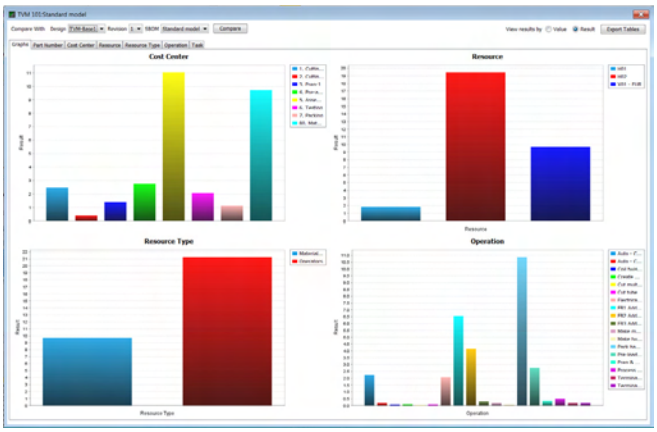
The processing scope of Operations can be extended using Capital Integration Server – this provides programmatic support in defining the behavior of an Operation, including access to data defined in external systems or databases within the organization.

Manufacturing Process Generation

The TVM processing engine applies a Pattern to a harness design by starting with the first Operation. The Operation will identify matching parts within the harness design – wires, for instance – and apply the Operation definition to the matching parts to create one or more sub-assemblies - the time and cost of the Operation is calculated from the Operation's tasks. This is then repeated for each further Operation in the pattern. Later Operations will typically process a combination of both harness design parts and previously created sub-assemblies to create higher level sub-assemblies. The final Operations will process existing higher level sub-assemblies to create the final harness and its associated packaging.

Quotation Process Overview

Using Capital Harness TVM, the quotation costing process is simple and fast. The costing engineer opens the harness design and selects the Create Costing action. The costing engineer then selects the appropriate "Quotation Pattern" from one of the pre-defined "Patterns", and the system automatically generates a fully detailed structured bill of material (SBOM) and its associated costs. The costing engineer can then generate costing reports in a variety of formats.



Cost and resource results can be analyzed to help optimize the manufacturing process

Cost Optimization

Capital Harness TVM provides extensive functionality for costing and value engineers that need to optimize the manufacturing process and cost of a harness beyond the scope of standardized SBOMs generated by the Quotation patterns.

The costing and process-planning engineers can investigate the effects of different patterns and can interactively modify the resulting SBOMs. Facilities are provided to support optimization either within the scope of a single factory, or in relation to multiple factories, each with different machine resources.

User controls are provided to help the engineer understand and analyze the results of the auto-generated SBOM, modify the SBOM, or generate alternate SBOMs by selection of different patterns.

The content of sub-assemblies can be cross-highlighted on the harness diagram, SBOM, and cost/time results, to provide dynamic feedback to the engineer. If needed, the BOM structure can be easily modified using "drag and drop" to change the balance of sub-assemblies; these user modifications can be preserved and automatically re-applied during any later revisions of the harness design.

For the latest product information, call us or visit: www.mentor.com/electrical

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