

# New Product Introduction (NPI)

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# New Product Introduction (NPI)

Estimated time to read: 14 minutes

New Product Introduction (NPI) is one of the fundamental concepts of manufacturing because it is the process of establishing a clear plan to take your product from its conceptualization to its final form. This process involves various stages, that may be different from project to project, but the end results are to reduce waste, avoid miscommunication, speed up production, and save time.

The Critical Manufacturing MES NPI module helps you achieve this by supporting the loading, association and visualization of an ECAD file of type ODB++ with a Product, and by supporting the loading of a Product BOM file with the component information.



NPI is a separately licensed module.

This document will guide you through the required configurations for the NPI functionalities.

### Overview

While manufacturing a product, it is a common practice to display technical drawings and schematics to assist the operator throughout the production process. Critical Manufacturing MES can help to associate the drawings to the products and to display these drawings when assembling the product. The concepts and functionalities of the Critical Manufacturing MES NPI module will be described in more detail over the next sections.

# Concepts

The table below describes the main concepts related to New Product Introduction.

| Concept   | Description   |  |  |
|-----------|---|--|--|
| ECAD      | ECAD (electronic computer-aided design) software is used to design and create electronic structures. Typically consists of multiple 2D layers. Some CAD files are very basic and only contain the drawings - in this case, separate additional files (centroid and BOM File) are required. Some CAD files are more advanced and they contain the layout, the list of components as well as the component placement information, Pin, and Net information. |  |  |
| MCAD      | MCAD (mechanical computer-aided design) is used to design and create mechanical systems.  MCAD can be used for previewing various design iterations, including assessing form factors and the fitment of certain physical elements.   |  |  |
| Schematic | A schematic is a representation of the elements of a system using abstract, graphic symbols rather than realistic pictures. A schematic usually omits all details that are not relevant to the key information the schematic is intended to convey and may include oversimplified elements in order to make this essential meaning easier to grasp.   |  |  |

| Concept                 | Description  |
|-------------------------|--|
| Drawing                 | A drawing (technical drawing) is used to convey information about an object. A common use is to specify the geometry necessary for the construction of a component and is called a detailed drawing. |
| Layer                   | There are multiple layers in an ECAD, some refer to the top side and others to the bottom side.  |
| Component               | A part used in an MCAD model, that is part of the BOM for a higher-level part.   |
| Reference<br>Designator | A Reference Designator identifies a component within an electrical schematic or on a printed circuit board. The Reference Designator usually consists of one or two letters followed by a number.    |

Table: New Product Introduction main concepts

# Setting up New Product Introduction Related Entities

To enable the New Product Introduction functionalities, it is necessary to set up the Critical Manufacturing MES entities.



Take the following example: the User aims to set-up a new Product for manufacturing, Product A. To manufacture Product A, the User has to create the required Products, BOMs and Checklists.

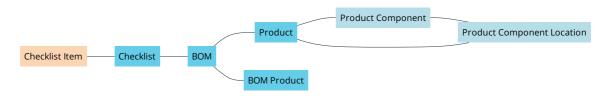
The CAD and BOM files should already be available.

In order to set up the NPI-related Entities it's necessary to follow the steps as described in the Table below.

| Step<br>Number | Step                               | Description  |
|----------------|------------------------------------|--|
| 1              | Create the necessary<br>Products   | Create the necessary Products and define their CAD, <u>BOM</u> , Schematic, and Drawing files. |
| 2              | Create the necessary<br>BOMs       | Create the necessary BOMs.   |
| 3              | Create the necessary<br>Checklists | Create the necessary Checklists for the manufacturing steps.                                   |

Table: Steps to setup the NPI-related Entities

The MES object model is displayed in the figure below.





The next sub-sections will cover the required configuration steps in more detail.

# 1 - Product

When preparing a Product for production, the User can define a Default BOM and it will be used to display the complete Product BOM tree structure by linking the different Product Default BOMs.



For the above-mentioned example, the User should create Product A and the Parts required for assembling it.

#### **CAD File Support**

Drawings and Schematics are key for the manufacturing of a product in many assembly and electronics industries. To achieve this, the User can upload ODB ++ ECAD files in MES. Currently, the system only supports this file type, however, in the future, further file types will be supported.

The generic table CAD File Information will be used to maintain general information of imported CAD files. The structure of this table is described in the Table below.

| Property                                     | Description   | Data Type                                      |
|--|---|--|
| File Type                                    | The name of the File Type   | String,<br>Mandatory                           |
| File Extensions                              | A semi-colon separate list of possible file extensions for the given File Type  | String,<br>Mandatory                           |
| Content Type                                 | Content of the FileType   | Enumeration,<br>Mandatory:<br>- MCAD<br>- ECAD |
| Includes BOM Information                     | Specifies whether the File Type contains BOM Information embedded within it   | Boolean,<br>Mandatory                          |
| Includes Reference<br>Designator Information | Specifies whether the File Type contains Reference Designator information embedded in it <b>Note:</b> this applies to ECAD files only     | Boolean,<br>Mandatory                          |
| Includes Component<br>Location               | Specifies whether the File Type contains Component<br>Location information embedded in it<br><b>Note:</b> this applies to ECAD files only | Boolean,<br>Mandatory                          |

Table: Generic Table CAD File Information properties

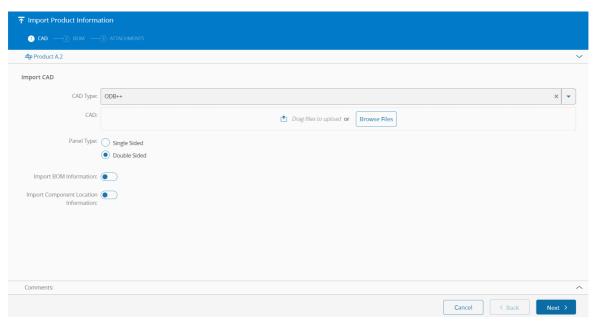
# **Import Product Information**

The User can link to the Product ECAD, BOM, Drawings, and Schematics files. Thus, on the creation of a Product, the User can access the Import Product Information wizard, displayed in the Figure below, and define the properties listed in the Table below.

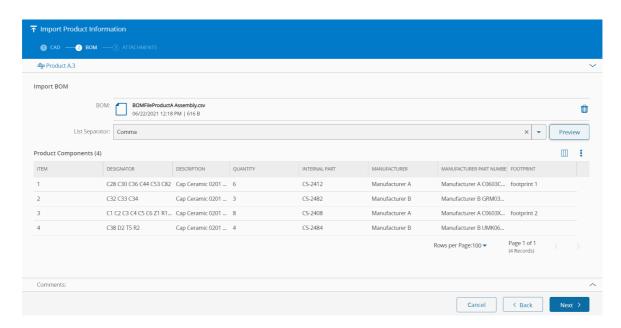
|--|

| Property                                 | Description  |
|--|--|
| CAD Type                                 | The Product CAD file type. Currently, only the ODB ++ format is supported.   |
| CAD File                                 | To store the Product CAD file.   |
| Panel Type                               | The Panel Type can be set for ECAD only and it defines whether the Product is single-sided or double-sided. This information is only for reference.              |
| Import BOM<br>Information                | Whether the BOM information will be imported from the CAD file.  |
| Import Component<br>Location Information | Whether the Component Location information will be imported from the CAD file.   |
| BOM File                                 | To store the Product BOM file, in case it's not included in the CAD file. The BOM File is parsed according to the File Import Template Generic Table definition. |
| List Separator                           | The Separator used within the BOM file (Comma or Semicolon).   |
| Schematic                                | A Schematic is a representation of the elements of a system.   |
| Drawing                                  | A Drawing is a type of technical drawing that is used to convey information about a Product.   |

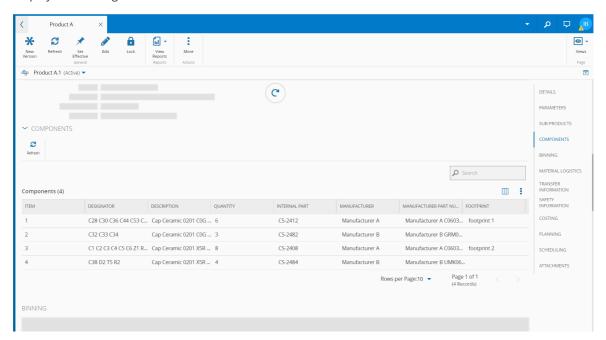
Table: Import Product Information properties



If the User selects a <u>BOM</u> file, the Product Components can be previewed by selecting the Preview button, as displayed in the Figure below. For the required structure of the <u>BOM</u> File please check the <u>BOM</u> File Support sub-section below.



The Product Components are listed under the Components section available in the Product Details view, as displayed in the Figure below.





For the given example, the User should upload for Product A and for the Products of the Parts required for assembling it: the CAD file, the BOM file, and any relevant Drawings and Schematics.

To perform automatic column mapping of specific file headers and standard system properties, the system uses the Generic Tables *File Import Information, File Import Property Information*, and *File Import Column Information*, as described in the Tables below.

| Property | Description | Data Type |
|----------|-------------|-----------|
|          |             |           |
|          |             |           |



| Property    | Description   | Data Type                                      |
|-------------|---|--|
| Entity Type | Describes for which Entity this information applies to          | Reference to an Entity Type -<br>mandatory     |
| Туре        | Describes the information type to import                        | Enumeration, Mandatory: - BOM - Centroid - CAD |
| Is Enabled  | Defines whether the import is enabled for this information type | Boolean, Mandatory                             |

Table: Generic Table File Import Information properties

| Property            | Description   | Data Type   |
|---------------------|---|---|
| Entity Type         | Describes to which Entity Type this information applies | Entity Type, Mandatory  |
| Туре                | Describes the information to be imported                | Enumeration, Mandatory: - BOM - Centroid This must be a list of known types |
| Property            | The name of the system property                         | String, Mandatory   |
| Data Type           | The property data type                                  | Enumeration, Mandatory  |
| Enumeration<br>Name | The enumeration name                                    | Boolean, Optional   |
| Is List             | Whether the property is a list or not                   | Boolean, Mandatory  |
| Is Mandatory        | Whether the property is mandatory or not                | Boolean, Mandatory  |

Table: Generic Table File Import Property Information properties

| Property    | Description  | Data Type  |
|-------------|--|--|
| Entity Type | Describes for which Entity this information applies to | Reference to an Entity Type - mandatory  |
| Туре        | Describes the information type to import               | Enumeration, Mandatory: - BOM - Centroid This must be a list of known types, same as File Import System Properties |
| Header      | Name of the file column header                         | String, Mandatory  |



| Property           | Description                 | Data Type         |
|--------------------|-----------------------------|-------------------|
| System<br>Property | Name of the system property | String, Mandatory |

Table: Generic Table File Import Column Information properties

### **BOM File Support**

Currently, Critical Manufacturing MES provides support for BOMs in CSV format.

The CSV file has to meet some structure requirements, as described in the Table below. Those are defined for the BOM entity, under the File Import Property Information Generic Table.



Please note that in the CSV file, the headers must be set and defined in the first row. The User can set any order for the columns and there is no culture when importing the CSV file.

| Property                    | Description  | Data Type            |
|-----------------------------|--|----------------------|
| Item Number                 | The BOM item number  | Number,<br>Mandatory |
| Reference<br>Designator     | A list of reference designators, mandatory for ECAD files. Separate by "spaces" or "," and use "-" for ranges. | String,<br>Optional  |
| Description                 | The description of the component   | String,<br>Optional  |
| Quantity                    | The BOM item quantity  | Long,<br>Mandatory   |
| Internal Part<br>Number     | The internal part number of the component  | String,<br>Optional  |
| Manufacturer                | The manufacturer   | String,<br>Optional  |
| Manufacturer<br>Part Number | The manufacturer part number   | String,<br>Optional  |
| Footprint                   | The geometry of pads for soldering certain electronic components  SMT Specific                                 | String,<br>Optional  |

Table: **BOM** CSV file properties



Note

For the given example, the BOM file for Product A would have the following information:



| ltem<br>Number | Internal<br>Part<br>Number | Description   | ReferenceDesignator     | Quantity | Manufacture    |
|----------------|----------------------------|---------------|-------------------------|----------|----------------|
| 1              | CS-2412                    | Part A top    | C28 C30 C36 C44 C53 C82 | 6        | Manufacturer , |
| 2              | CS-2482                    | Part B bottom | C32,C33,C34             | 3        | Manufacturer   |
| 3              | CS-2408                    | Part C side   | C1-6 Z1 R102            | 8        | Manufacturer , |

Table: BOM file example

# 2 - BOM

When creating a <u>BOM</u> with Scope Materials or Weigh & Dispense it is possible to define the properties listed in the Table below.

| Property        | Description  |
|-----------------|--|
| Product         | The selected Product will allow to link the <u>BOM</u> to that specific Product and to re-use the Product CAD, Drawing, and Schematic files. |
| Drawing<br>File | The User can add a Drawing file.   |

Table: BOM properties

For each <u>BOM</u> Item of a <u>BOM</u> with Scope Materials it is possible to define a **Reference Designator**. This only applies to BOMs that reference a Product that contains an ECAD file.



For the given example, the User should create the BOMs required for assembling Product A and for assembling the Parts of Product A.

# 3 - Checklist

When processing a Material at a certain Step, the User might require some visual aid in order to guide him/her throughout the operation's steps. This can be attained by having an instruction displayed when performing a Checklist. The properties to be configured are detailed in the Table below.

| Property       | Description   |
|----------------|---|
| Scope          | The Scope must be defined as Material Tracking.     |
| Execution Mode | The Execution Mode must be defined as Long Running. |



| Property | Description  |
|----------|--|
| ВОМ      | The BOMs available for selection have the Type defined as Materials or Weigh & Dispense. |

Table: Checklist properties

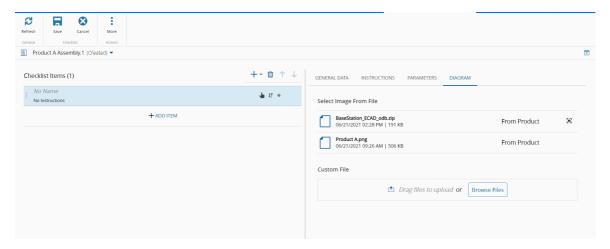


For the given example, the User should create the Checklists to guide the User when assembling Product A and when assembling the Parts of Product A.

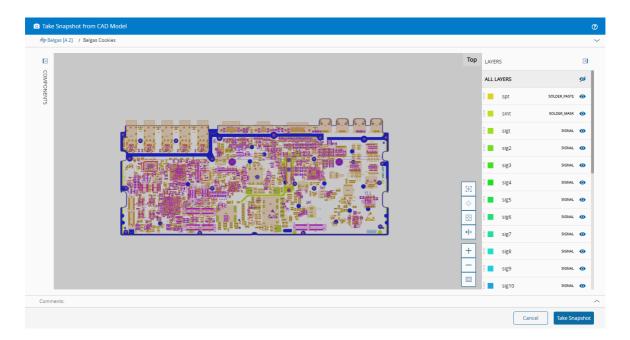
#### Diagram

It is possible to define a Diagram for a Checklist Item, i.e. a file that provides instruction with some sort of visual aid for the User when performing the Checklist.

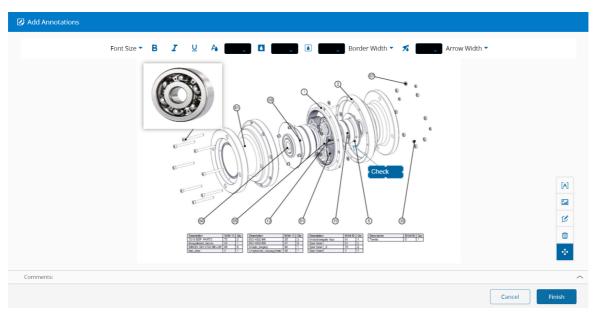
The <u>BOM</u> property Drawing File and the Product properties CAD File, Schematic, and Drawing are available for selection if a <u>BOM</u> is defined for the Checklist and this <u>BOM</u> as a Product defined, as displayed in the Figure below.

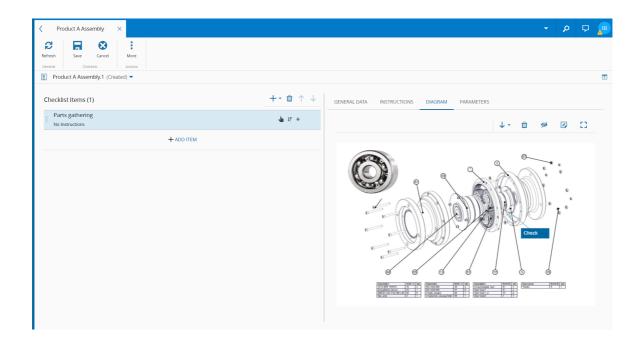


For dynamic files (e.g CAD), the User needs to take a snapshot from the CAD viewer to use as a static image and to be able to add annotations, as displayed in the Figure below.



It is also possible to configure annotations and add ../../images for files or snapshots through the Add Annotations wizard available in the Diagram tab of the Checklist Item, as displayed in the Figures below.





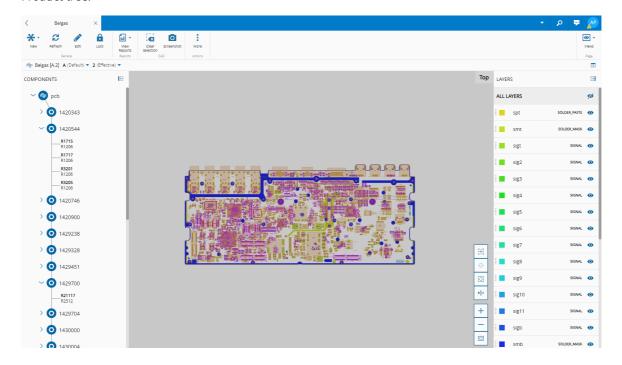
# Using New Product Introduction

After setting up the required configurations mentioned in the previous sections, the NPI functionalities can be used, as described in the next sections.

#### **CAD** Visualization

If a Product has a CAD file defined, the CAD view will become available, as displayed in the Figure below.

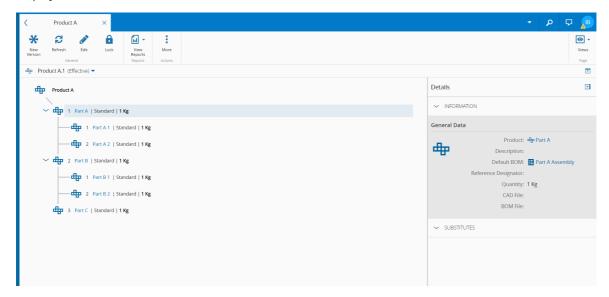
On the right-hand side of the screen it possible to show/hide layers. On the left-hand side of the screen, it is displayed the Product tree, with the Product Components and Reference Designators and it is also possible to select a Reference Designator that will be highlighted in the CAD drawing. By double-clicking on a Reference Designator in the CAD drawing, the Reference Designator name will be highlighted in the Product tree.





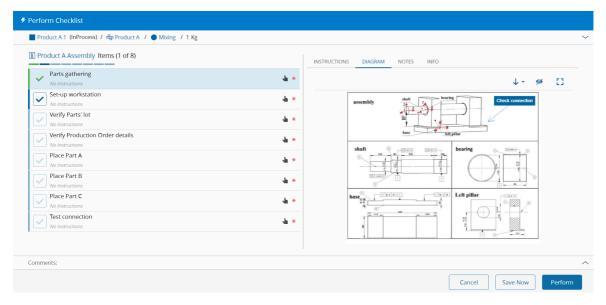
# **Product BOM Structure Visualization**

If a Product has a Default <u>BOM</u> defined, the <u>BOM</u> Structure view will become available, as displayed in the Figure below. If the <u>BOM</u> Items of the Product also have a Default <u>BOM</u> defined, their <u>BOM</u> Items will be displayed as well.



## Perform Checklist

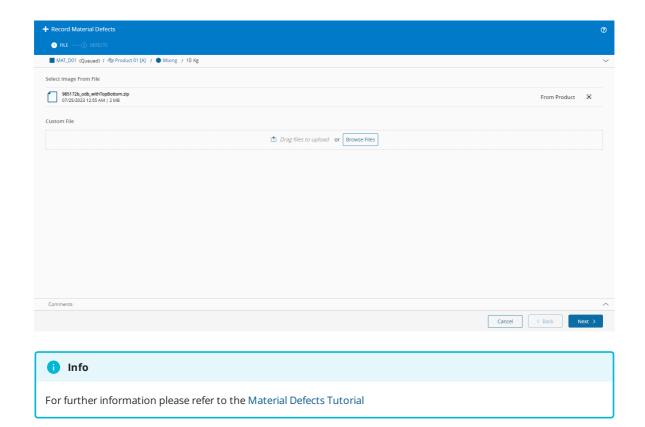
When performing a Checklist, if a Diagram is defined, it will appear together with the defined annotations, as displayed in the Figure below.



### Record Material Defect using Picture

When recording a Defect for a Material, the User can specify a Defect Reason in a Drawing, either in a snapshot of the Product CAD file or in an image. The image can either be provided by the Drawings linked to the Product of the Material or provided when recording the Defect, as displayed in the Figure below.







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