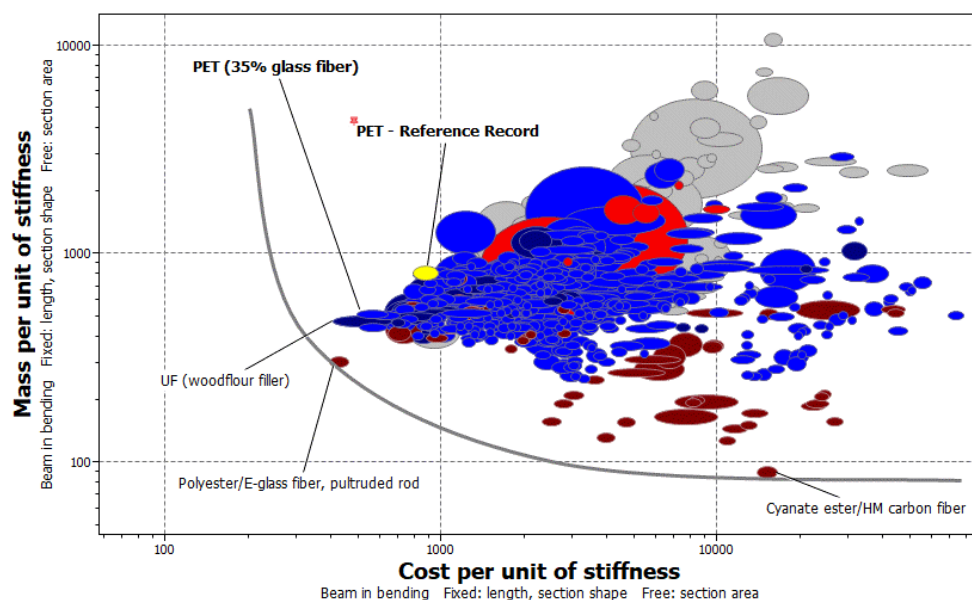


# Getting Started with GRANTA Selector

## *Select using advanced Chart Stage tools*



# 1 About these exercises

The Getting Started exercises provide an overview of the key tools and features in GRANTA Selector, and form a set of tutorials to help you familiarize yourself with the software. You can choose whether to work through them in order, or complete only the exercises relevant to you. They are intended for use with GRANTA Selector 2020, and may not work correctly with earlier or later versions of GRANTA Selector.

There are also [Quick Start Videos](#) provided online to teach you about GRANTA Selector. These can be used independently of the videos, or alongside them, to test and check your knowledge.

This set of exercises covers advanced selection techniques and how to apply them in a Chart Stage: plotting combined properties, using performance indices, and creating trade-off plots.

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## Document conventions

In this document:

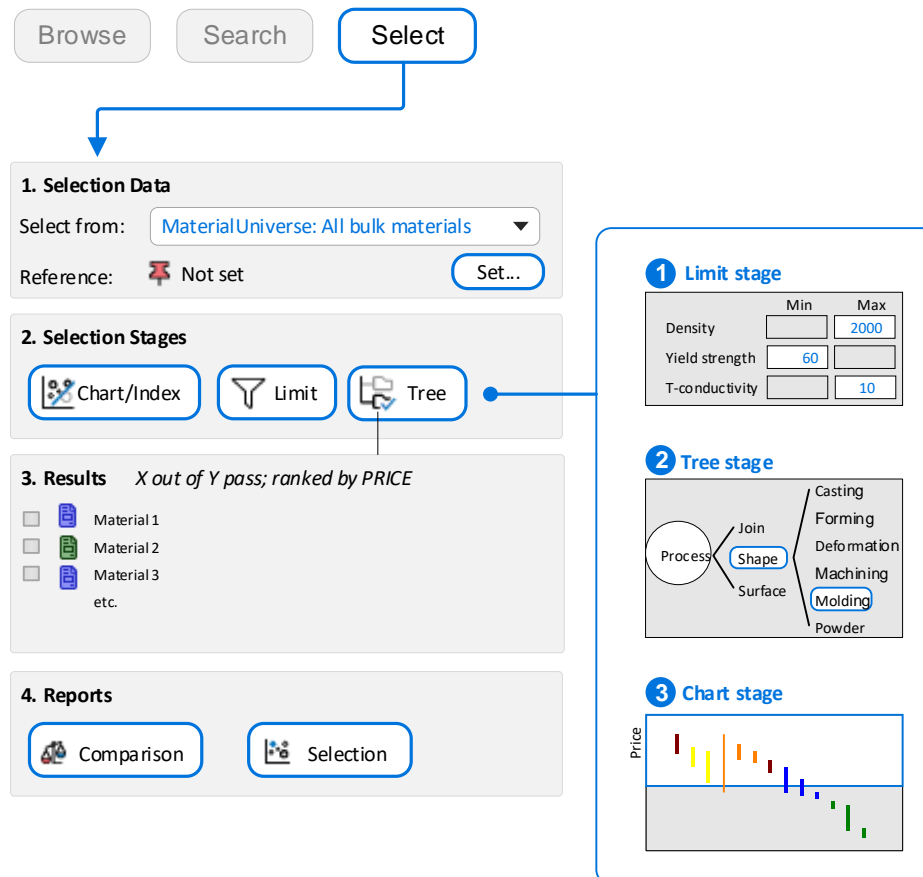
- ❖ Each step of the exercises is shown on a blue background, like this.

More detailed instructions appear below the main instruction.

Text on elements in the software (such as buttons, dialogs and tabs) appears in **bold**, **like this**. The names of records, datatables, and documents are emphasised *like this*. Words and numbers that you type as you follow the instructions appear in monotype, `like this`.

## 2 Exercises

### Exercise 1: Combining Filtering and Charting Tools



- ❖ Choose the data source and set a reference record.

**Select from:** MaterialUniverse: All bulk materials

**Reference:** POM (homopolymer)

- ❖ Select materials with specific physical, mechanical, and thermal properties.

Add a Limit Stage with the following criteria:

Density	< 2000 kg/m <sup>3</sup>
Yield strength (Elastic limit)	> 60 MPa
Thermal conductivity	< 10 W/m.°C

**❖ Filter the results to find those that can be *Thermoformed***

Add a Tree Stage and select **ProcessUniverse > Shaping > Molding > Thermoforming**.

**❖ Rank the results by *Price***

Add a Chart Stage with a bar chart of *Price*. On the Chart Stage, all materials that fail one or more stages are grayed out. The **Results** window lists the materials that pass all stages.

In the **Rank by** list, select *Stage 3: Price*.

**❖ Compare the three cheapest materials**

Select the top three records in the **Results** list and click the **Comparison** button below the list to add them to a Comparison Table with the reference record.

**❖ Create a Selection Report**

Below the Results list, click **Selection**.

A selection report is created, containing a summary of the selection project on the first page, details of each selection stage on the following pages, and the comparison table on the final page.

## Exercise 2: Plotting a combined property

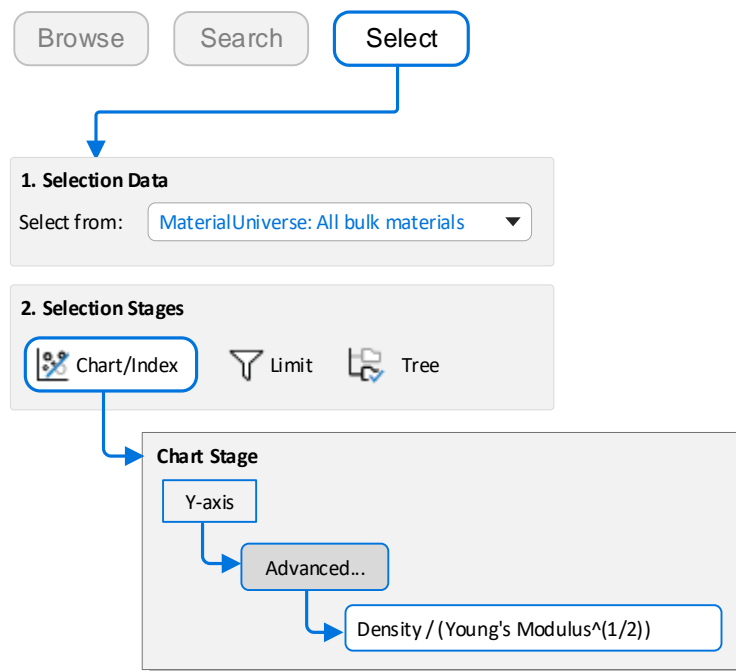
Many engineering applications require combined properties to be optimized. For example, *specific stiffness* (Young's modulus / density) in aerospace and *thermal diffusivity* (thermal conductivity / (density \* specific heat)) in thermal applications. You can plot these types of properties using the **Advanced property** feature.

- ❖ Make a bar chart of the combined property  $Density / (Young's modulus)^{1/2}$

In the Chart Stage dialog, at the top right-hand side of the **Y-Axis** tab, click **Advanced**. In the Set Axis dialog, select an attribute and click **Insert** to build the expression.

Leave the x-axis with no attribute set to generate a bar chart.

- ❖ Delete this stage.



## Exercise 3: Performance Index Finder

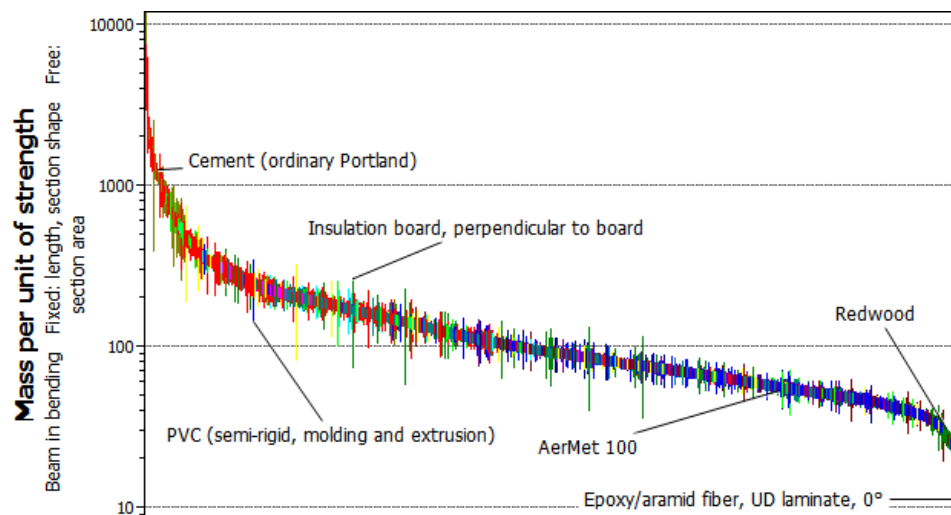
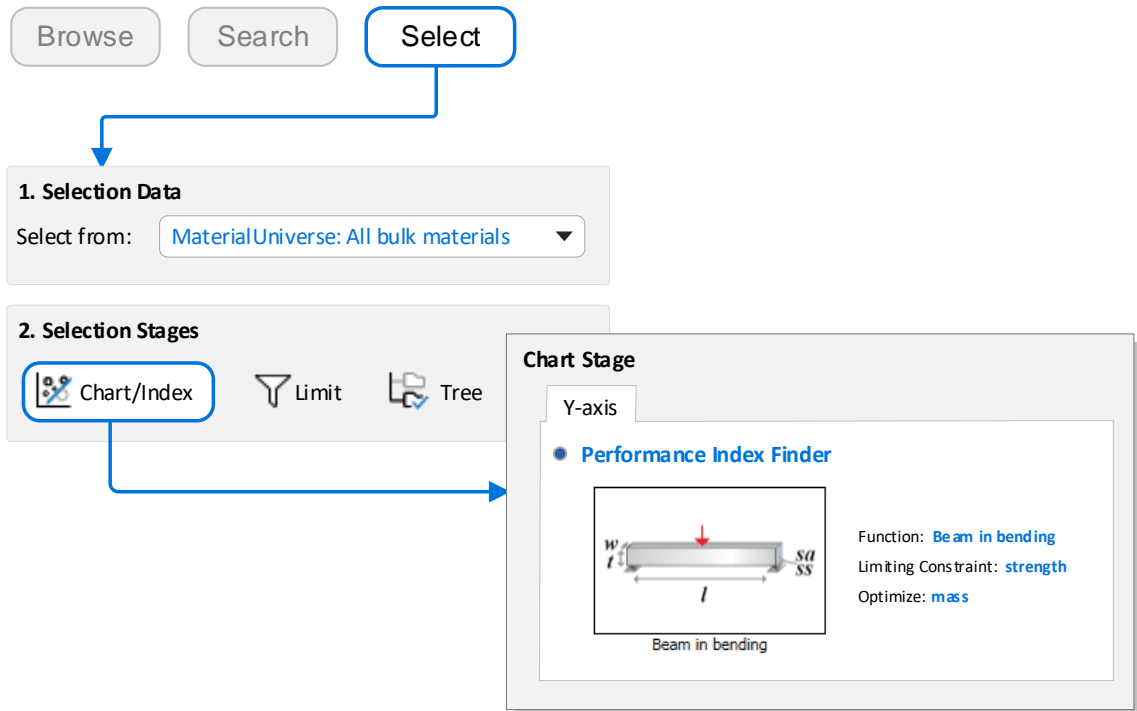
One of the main components of systematic material selection is the use of performance indices. These are combined properties that allow the function of a design to be optimized for a particular application. The **Performance Index Finder** enables users to quickly identify (and plot) the performance indices that are applicable to their design.

- ❖ Make a bar chart of the performance index for minimizing the mass of a strength-limited beam, loaded in bending

In the Chart Stage dialog, on the **Y-Axis** tab, select **Performance Index Finder**.

Select the *Beam in bending* function.

Set *section area* as a free variable, strength as the *limiting constraint*, and optimize for mass.

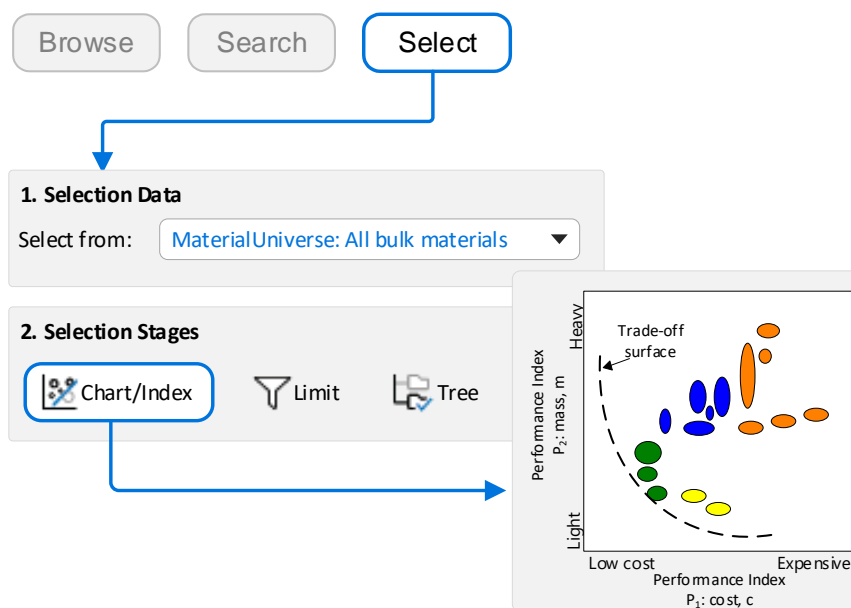


### Exercise 4: Selection with a Trade-off Plot

Many designs require a compromise to be made between competing objectives, for example, maximize performance and minimize cost. The influence of this 'trade-off' on material choice can be studied by generating a trade-off plot, where candidate materials lie along a hypothetical curve or trade-off surface. You can identify optimal materials for a particular application by making a judgment on the relative importance of the two objectives (for example in aerospace, high performance is more important than low cost).

- ❖ Make a bubble chart of the performance index for a strength-limited *Beam in bending*

Set the y-axis to optimize mass and the x-axis to optimize cost.



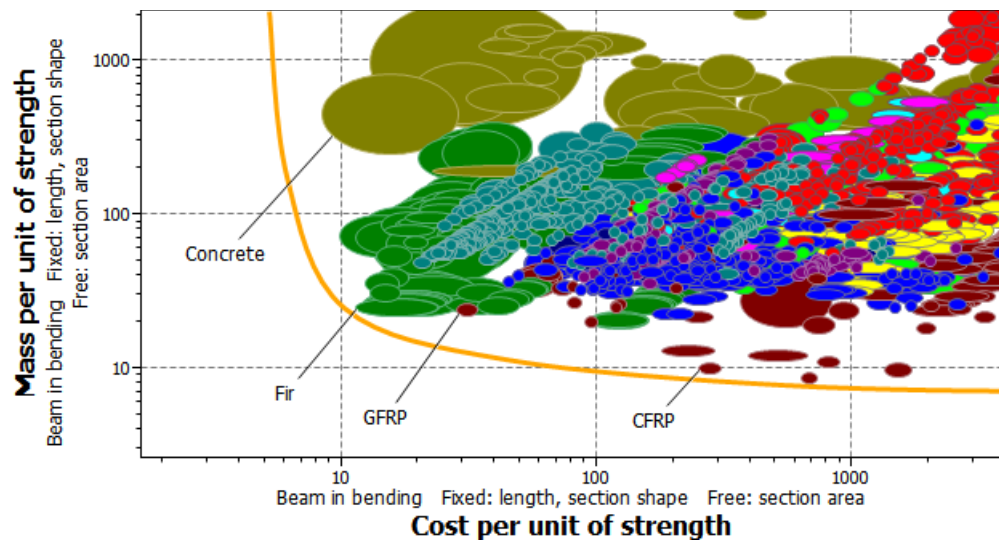
- ❖ Create a trade-off curve by adding a curve annotation to the chart

On the Chart toolbar, click  **Curve**.

Click the chart at the points you want the curve to pass through.

Press **Enter** to finish editing the curve.

The curve is a guide to the eye, and does not perform selection. The materials closest to the trade-off curve offer the best compromise for minimizing mass and cost.





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