ANSYS | **GRANTA**

Release Notes:
CES Selector 2019

Key new features in CES Selector 2019

- New **Additive Manufacturing Edition**—Consider additive manufacturing in material selection studies and understand how the performance of additive grades compare with equivalents produced using conventional technology. See items 1 and 2.
- The **Senvol Database™** of additive manufactured materials and machines **added to the Aero, Medical, Metal and Polymer editions**. See item 3.
- New **performance indices for component vibration**—enables vibration characteristics to be considered alongside technical, economic and environmental requirements. See item 4.
- New and enhanced **FEA Exporters for polymer data sets**—Create material cards for materials in the Prospector Plastics and CAMPUS & M-Base Plastics data sets, and apply scaling or knock-down factors to account for differences in material performance when formed into simple test coupons and more complex real-life components. See items 5 and 6.
- New **Professional Level content** for the CES Selector Certificate Program—Understand how and when to apply the different selection methodologies and tools in CES Selector. Includes guidance on how to define design requirements and a material selection decision tree. See item 7.
- Access the **latest data**—Updated versions of the MaterialUniverse, Senvol Database™, JAHM Curve Data, CAMPUS & M-Base Plastics, Prospector Plastics, and MMPDS-12 data modules. See items 8 through 20.

These and other enhancements are detailed below. Descriptions are organized in sections according to:

- Additive manufacturing (AM)
- Vibration analysis
- Support for simulation
- CES Selector Certificate Program
- MaterialUniverse (core filtering data set)
- Specialist data sets
- Help and Support
- Miscellaneous developments

What's New?—Detailed Descriptions

This section details the new features and enhancements in CES Selector 2019.

Additive Manufacturing (AM)

1. New **Additive Manufacturing Edition**—incorporating an enhanced version of the Senvol Database™ of additive manufacturing materials and machines (see item 2). Includes links to equivalent materials produced by conventional technology in MaterialUniverse.
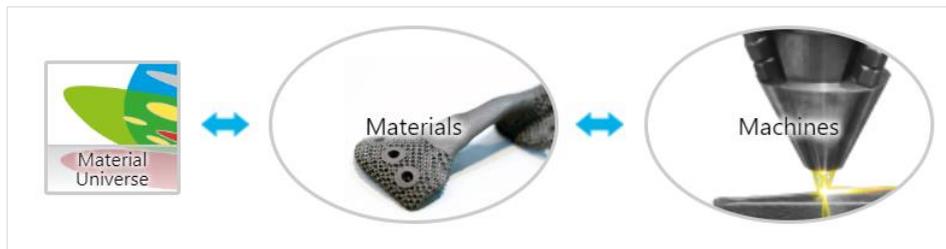
    Benefits:

    *   Understand this rapidly growing material sector, and answer questions such as: which AM materials are available, how do they compare with conventional materials, and which AM grades and machines are appropriate for the target application?
    *   Use MaterialUniverse data to fill gaps in the data provided by AM suppliers, such as durability and temperature resistance.
    *   Consider additive manufacturing alongside conventional technologies in material selection studies.

2. **Enhanced version of the Senvol Database™** of additive materials and machines—optimized to function with the data and tools in CES Selector, and to answer key questions for companies considering the use of AM technology. Enhancements include:

    *   The latest AM data, including over 490 new materials and 180 new machines, to increase the database to over AM 1700 materials and over 960 machines.
    *   Over 120 materials produced by conventional technology added to the database, enabling direct comparison between materials produced by additive and conventional technologies.
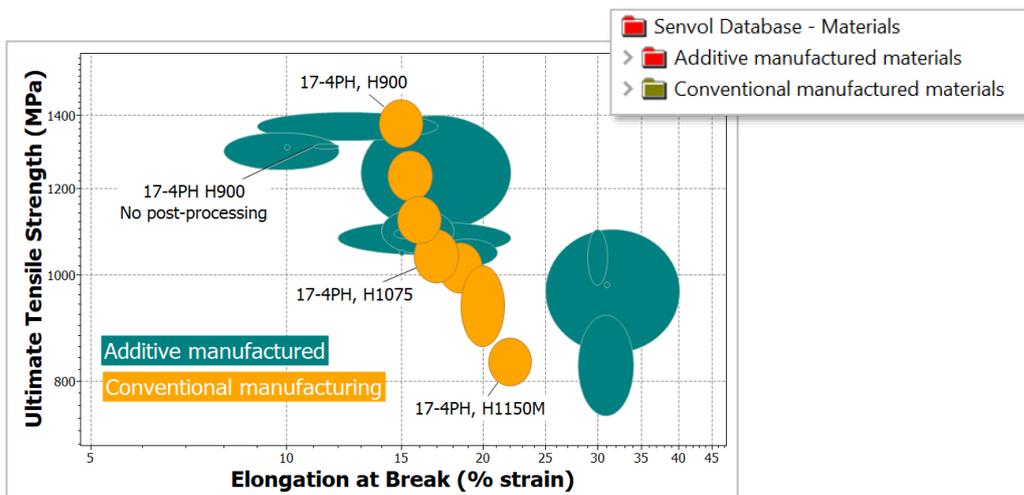
- AM grades in the Senvol Database^{TM} have datasheet links to equivalent MaterialUniverse records produced using conventional technology. Enables you to consider AM materials and conventional materials together during material selection studies.
- The classification of AM materials has been updated to accommodate 'like' materials. These are AM materials that have similar performance to a conventional material, but are in fact produced from a *different* material. For example, many materials produced by photopolymerization are based on thermoset resins (e.g. epoxy) but are marketed as being like thermoplastics (e.g. ABS-like). 'Like' materials are readily identified from the tree structure and datasheet name.
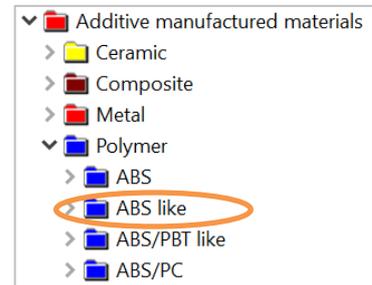
- New Process attribute added to material datasheets, identifying the ASTM AM process used. Enables you to select AM materials based on their processing method.
- Revised and updated Similar conventional material attribute. Available options have been standardized and consolidated, enabling AM grades to be quickly identified by conventional material grade (e.g. Titanium alloy Ti-6Al-4V)


Benefits:

- Access the largest and most comprehensive data set on additive manufacturing materials and machines.
- Directly compare the performance of AM grades with the equivalent produced by conventional technology.
- Easier to identify and compare specific grades of an AM material.

3. **Senvol Database^{TM}** of additive materials and machines **added to Aero, Medical, Metal, and Polymer Editions**, with links to equivalent materials produced by conventional technology in MaterialUniverse.

Benefits:

- Access the largest and most comprehensive data set on additive manufacturing as part of the advanced editions of CES Selector
- Consider additive manufacturing alongside conventional technologies in material selection studies

Vibration analysis

4. **New performance indices for vibration characteristics**—Use the Performance Index Finder to consider how different component designs are affected by vibration loading (such as engine noise, airflow over the component, or airborne sound), and understand how vibration characteristics, such as resonant frequency and vibration amplitude, change with material choice.

Flexural vibration

Vibration amplitude
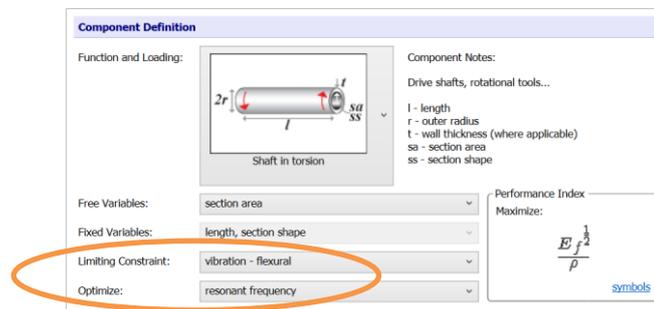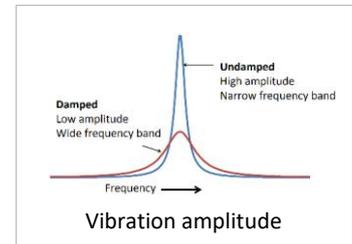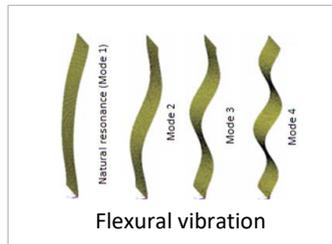
Benefits:

- Consider vibration for standard engineering designs, such as tie in tension, column in compression, shaft in torsion, beam in bending, panel in bending, and panel in compression.
- Consider vibration characteristics alongside performance and economic considerations in material selection studies.
- Identify potential issues with vibration early in the development cycle and avoid issues such as fatigue, wear, and noise generation, especially in the automotive, aerospace, and transportation industries where components are often subjected to vibration loads

Support for simulation

The FEA Export capability in CES Selector has been expanded and enhanced to cover the following CAD/CAE packages and data tables.

FEA Exporter	Compatible data table			
	MaterialUniverse	**MMPDS-12**	**CAMPUS and M-Base Plastics**	**Prospector Plastics**
ANSYS Workbench	✔	✔	✅ Enhanced	➕ New
Abaqus	✔	✔	✅ Enhanced	➕ New
ANSYS MAPDL (ANSYS Classic)	✔	✔	➕ New	➕ New
SolidWorks	✔	✔	✅ Enhanced	➕ New
MatML	✔	✔	➕ New	➕ New
Nastran	✔	➕ New	➕ New	➕ New
Creo Parametric (Pro/ENGINEER)	✔	✔	✅ Enhanced	➕ New
solidThinking Inspire	➕ New			➕ New

5. **New and enhanced FEA exporters for polymer data modules**—includes the following developments:

   - New set of exporters for Prospector Plastics, covering all supported CAD/CAE packages.
   - New ANSYS Classic, MatML, and Nastran exporters for CAMPUS & M-Base Plastics.
   - All CAMPUS & M-Base Plastics exporters extended to export data from M-Base records (identified with a red record color in the browse tree).
   - 'Scaling factor' added to Prospector Plastics and CAMPUS & M-Base Plastics FEA exporters, enables you to apply a scaling, or knock-down factor, to the exported strength and modulus values. Allows you to produce more realistic simulations to account for differences in performance between test coupons and real components, caused by different flow patterns during mold fill.

Polymer flow in test coupon

Polymer flow in component
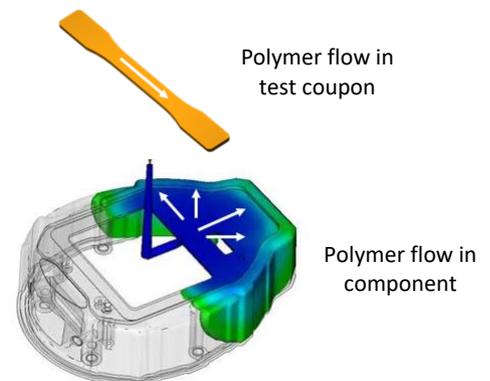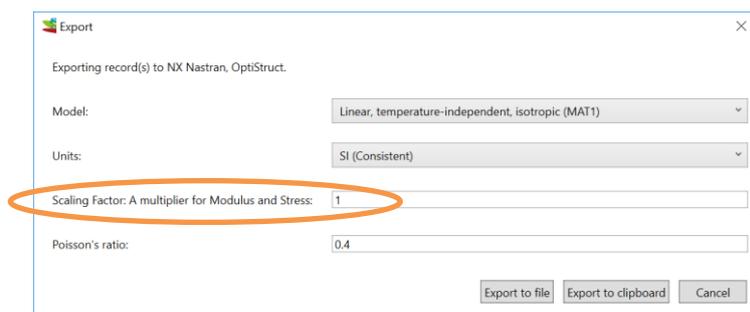
Benefits:

   - Create simulation-ready material cards for materials in Prospector Plastics and CAMPUS & M-Base Plastics. Save time, and avoid formatting and unit conversion errors.
   - Apply knock-down factors to strength and stiffness values (e.g. 0.7) to account for the difference in performance between test coupons (best case scenario) and more complex components.

6. **New FEA exporters for solidThinking Inspire**—Altair's generative design/topology optimization simulation software for concept development. Export data from MaterialUniverse and Prospector Plastics into the format required by solidThinking Inspire.

   Benefits:

   - Create simulation ready material cards for solidThinking Inspire. Save time, and avoid formatting and unit conversion errors.

CES Selector Certificate Program

Available on Granta's E-Learning Site. Provides learning materials, case studies, and self-assessment tests on how to apply the data and tools in CES Selector.

Register and enrol for CES Selector Certificate Program - Professional User course [here](#).

7. New **Professional Level course**—aimed at helping users understand & apply the different material selection tools and methodologies in CES Selector. This first version provides the core content and learning materials. Certification and self-assessment tests will be added in future versions.

   Core content includes:

   - **How to define design requirements**—overview of the different types of requirements; guidance and strategies for establishing key requirements for a target application; and converting them into material selection criteria.

   - Interactive **Selection workflow**—recommended steps for applying the data and tools in CES Selector to a material selection problem; starting from when a material issue comes in, right through to the communication of results to stakeholders at the end of the project. - Each step is illustrated with supporting materials.
   - **Material selection decision tree**—Interactive resource for identifying the most appropriate data set and tools for a selection scenario – based on 6 key questions, such as 'Is the geometry fixed?' and 'Do you know the important properties?'.

   - **Industrial case studies**—short video clips illustrating application of the key data and tools in CES Selector to solve the five main types of selection scenario.
   - **Communicate and share results**—Examples of how to: modify charts to help communicate your findings in presentations and reports; document the selection process; and create material cards ready for import into simulation and modeling packages.
   - **Glossary of tools**—in-depth information and help on all the key tools used in the industrial case studies.
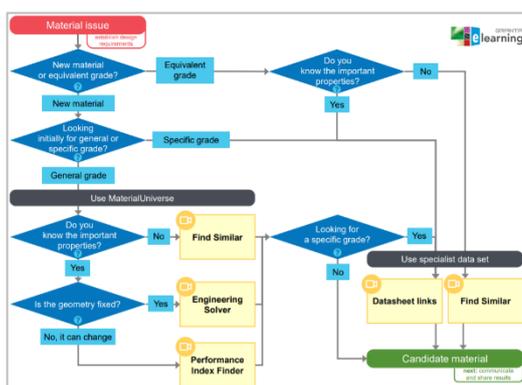
| Interactive material selection decision tree | Interactive selection workflow |
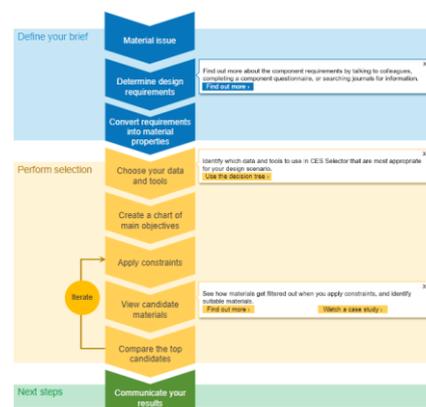
Benefits:

- Understand how to apply the key data tools and selection methodologies in CES Selector.
- Use the decision tree and selection workflow to check that you are applying the correct tools and techniques for your specific selection scenarios.
- Communicate your findings in a clear and compelling way.
- Get the most out of your usage of CES Selector.

MaterialUniverse (core filtering data set)

8. Updated **Material prices**—new prices are available for all 4,000+ materials in MaterialUniverse. These have been generated using Granta's price model, based on data from the world commodity markets.

   Benefits:

   - Use up-to-date prices, reflecting current differences between material types and classes.
   - Accurate cost reduction initiatives.
   - Accurate trade-off studies, such as mass vs cost, and plastics vs metals.

9. Revised and **updated Food Contact** attribute—data for polymeric materials updated to reflect the latest availability of food contact grades on the market.

   Benefits:

   - Use the latest information when pre-screening materials for food contact.

10. 8 new **ferritic and duplex stainless steels** added—exhibit high corrosion resistance with relatively low-nickel content, with PRE numbers ranging from 30 to 50. Typically have high strength and elongation, often to high temperatures.

    - Ferritic, UNS S44627, annealed (E-Brite)
    - Duplex, 25-4-4 (UNS S44635) (Monit)
    - Duplex, 26-3-3 (UNS S44660) (Sea-Cure)
    - Duplex, 29-4-2 (UNS S44800)
    - Ferritic, S44700
    - Duplex, cast, J93380 (Zeron 100, cast)
    - Duplex, wrought, S32750
    - Duplex, S33207 (Sandvik SAF 3207 HD)

    Benefits:

    - Improved selection of steel for use in highly corrosive environments, often containing chloride and hydrogen sulphide. Particularly relevant to industries such as oil, marine, and chemical processing.

11. **12 new 7XXX series aluminum alloys**—offering improved strength, fracture toughness, corrosion resistance, and ease of processability over more standard 7000 series alloys.

7056-T7651	Aerospace applications: upper wing panel. Significant improvement in fracture toughness compared to 7449
7068-T6511	High strength, lightweight, for aerospace and automotive (Kaiser). Replacement for 7075, 7050 and 7049
7136-T6511	Developed for high strength aerospace applications that also demand corrosion resistance
7255-T7751	Aerospace applications: upper wing material (Alcoa). Improved fatigue performance compared to 7055.
7349-T6511	Developed as a replacement for AA7150 in applications under compressive stress because they have higher strength than AA7150.
7037-T7452	Alloy 7037 was developed to have a 10 - 20% higher yield strength than 7010 or 7050. The alloy was designed to achieve the same strength, ductility, and fracture toughness for cross sections up to 250 mm compared to conventional alloys with a thickness of 200 mm. Its low quench sensitivity allows a slower cooling after solution heat treatment than for 7010 and 7050 at thicknesses up to 100 mm.
7055-T74511, T76511	This temper was developed to achieve a combination of high strength and improved corrosion resistance. Developed by Alcoa to replace 7075-T6511. It's "user friendly" meaning subcontractors and end users can perform forming, solution heat treatment and final aging on this alloy.
7085-T7452, T7452	The combination of high strength, fracture toughness and corrosion resistance in thick sections makes 7085 a suitable replacement for 7050.
7014-T651, T761	High strength heavy aircraft forgings

Benefits:

- Enhanced selection of aluminum alloys for aerospace applications, such as wing panels and heavy forgings.

12. New record for **aluminum titanate added**—doped ceramic exhibiting high thermal conductivity, low thermal expansion and extremely good thermal shock resistance, as well as high resistance to wetting by liquid metals.

   Benefits:

   - Improved selection for applications where minimal wetting by metals is desirable, such as crucibles, launders, pouring spouts, ladles, riser tubes, plugs, and exhaust manifolds.
   - Particularly useful for aluminum processing.

13. New record for **unfilled PDCPD**—polymer of dicyclopentadiene. Characterized by high impact resistance, high corrosion resistance and high heat deflection temperature. Typically produced by resin transfer molding or reaction injection molding.

   Benefits:

   - Improved selection for applications such as vehicle panels, butterfly valves, screens, chemical processing, and storage containers.

14. New record for **PLGA** (polylactic-glycolic acid)—biodegradable and bioabsorbable polymer used for sutures, fracture fixation, oral implants, drug-delivery microspheres, and in-vivo imaging.

   Benefits:

   - Improved selection for bioengineering and medical applications requiring biodegradable and bioabsorbable characteristics.

15. Datasheets for **Human bone and tissue** added to all CES Selector Editions—previously only available in the Medical Edition. Listed under 'Natural materials' in the 'Hybrids' folder of MaterialUniverse.

    - Includes data for trabecular and cortical bone.
    - Due to the nature of these materials, the data quoted is limited to mechanical and physical properties for bone; and mechanical, thermal, and physical properties for soft tissue.

    Benefits:

    - Supports the development of medical devices that come into contact with the human body.
    - Enables synthetic materials to be screened based on their similarity to the properties of the bone or tissue it comes into contact with.
    - Aids the development of surgical tools that need to cut bone or tissue.

    ```
    ∨ ☐ Hybrids: composites, foams, honeycombs, natural materials
      ∨ ☐ Natural materials
        ∨ ☐ Biological
          ∨ ☐ Mineralized tissue
              ☐ Dentine
              ☐ Enamel
            ∨ ☐ Human bones
                ☐ Acetabulum trabecular bone
                ☐ Femur cortical bone
                ☐ Femur trabecular bone
                ☐ Humerus cortical bone
                ☐ Humerus trabecular bone
                ☐ Radius cortical bone
                ☐ Radius trabecular bone
                ☐ Tibia cortical bone
                ☐ Tibia trabecular bone
                ☐ Vertebrae trabecular bone
        ∨ ☐ Soft tissue
            ☐ Artery and vein
            ☐ Cartilage
            ☐ Human skin
            ☐ Ligament
            ☐ Muscle
            ☐ Tendon
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Specialist data sets

16. **Latest version of JAHM Curve Data** module, compiled by JAHM Software Inc.—Provides temperature-dependent curve data for over 2900 materials, including mechanical, thermal, physical, electrical, and magnetic properties; stress-strain curves; and fatigue and creep data. Latest database includes over 780 new curves.

    Benefits:

    - Fast access to difficult-to-find temperature-dependent curve data for materials.
    - Select and compare materials suitable for use at elevated temperatures.

17. Enhanced version of the **Senvol Database**^TM – The most comprehensive data set of additive manufacturing (AM) materials and machines. Development includes:

    - The latest AM data, including over 490 new materials and 180 new machines, expanding the dataset to over 1700 AM materials and over 960 machines.
    - Dataset supplemented with data for over 120 materials produced using conventional technologies. See item 2.
    - AM material datasheets linked to equivalent records in MaterialUniverse.
    - Dataset available in CES Selector Aero, Medical, Metal, and Polymer Editions. See item 3.

    Benefits:

    - Access the largest and most comprehensive data set on additive manufacturing materials and machines.
    - Directly compare the performance of additive manufacturing grades with the equivalent material produced by conventional technology.

18. Latest version of **Prospector Plastics**—a global library of plastic and elastomer datasheets from UL Prospector. Includes the latest data for over 99,000 grades from over 900 manufacturers and specialty compounders. The latest version includes the following enhancements:

    - New true/false attributes for 'Food and Drink', 'Medical Healthcare' and 'Yellow Card available', enabling you to quickly filter the data based on whether approvals in these areas have been reported on the supplier's technical data sheet.

    - New FEA Exporters to create simulation-ready material cards for ANSYS Workbench, ANSYS Classic, Abaqus, SolidWorks., MatML, Nastran, Creo Parametric (Pro/ENGINEER) and solidThinking Inspire. See item 5

    Benefits:

    - Access the latest version of this global library of plastics data.

    - Export material cards ready for simulation in CAD/CAE packages. Save time, and avoid formatting and unit conversion errors.

19. Latest version of **CAMPUS and M-Base Plastics**—includes the full data set from the M-Base Material Data Center and CAMPUS (Computer Aided Material Properties to Uniform Standards). The latest version includes the following enhancements:

    - All CAMPUS and M-Base Plastics exporters extended to export data from M-Base records (identified with a red record color in the data set). Previously, only data from CAMPUS datasheets could be exported. See item 5.

    - New FEA Exporters for ANSYS Classic, MatML, and Nastran. See item 5.

    Benefits:

    - Access the most up-to-date version of this comprehensive source of plastics data.

    - Export CAMPUS and M-Base data into the format required by CAD/CAE packages. Save time, and avoid formatting and unit conversion errors.

20. Latest version of **MMPDS-12**—The Metallic Materials Properties Development and Standardization (MMPDS) handbook (formerly known as MIL-HDBK-5) is the preeminent U.S. source for aerospace component design allowables relating to alloys and fasteners. MMPDS contains over 2,800 records of statistically derived design data for aerospace alloys in various forms, thicknesses, and heat treatments.

    Benefits:

    - Get access to the most up-to-date version of this critical source of design allowables for the global aerospace sector.

Help and Support

21. New **French and German versions of the Quick Start Videoes**— accessed from links on the database homepage.
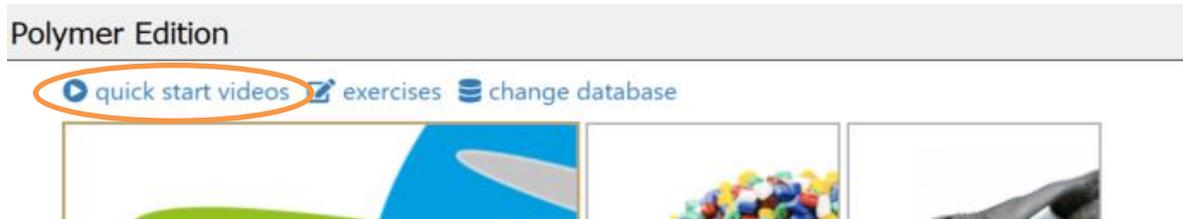
Benefits:

- Listen to the quick start videos in English, French, or German.
- Reduce the time to get up and running and start applying CES Selector to answer your material questions.

22. New **option to access software help offline**—option displayed automatically when 'Help' accessed without an internet connection.

    Benefits:

    - Access help when travelling or in locations with no internet access.
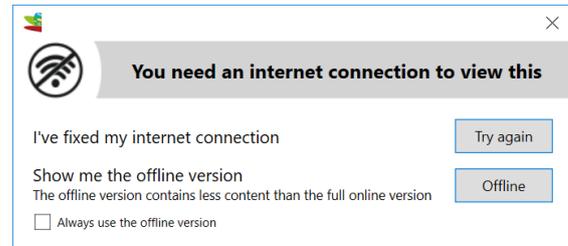
Miscellaneous developments

23. **Truck sizes revised in Eco Audit Tool**—Truck options in transport phase and mobile use phase revised and updated to cover a wider range of options, and names updated to include number of axles.

    Benefits:

    - Wider range of truck sizes available.
    - Easier to identify the appropriate truck size.
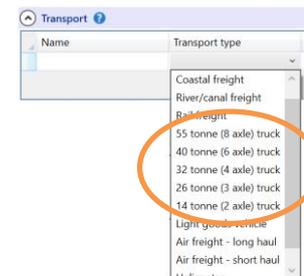
24. **CES Constructor now supported on high definition monitors.**

    Benefits:

    - Enhanced user experience when using CES Constructor on high definition monitors.

Feedback

The expert staff at Granta Design can provide advice on database design issues and can provide a consulting service to help with major database development projects. Granta Design would welcome your feedback on any improvements you would like to see in the CES Selector system, its data or documentation.

Please send your ideas using the **Feature Request** button on the main toolbar. Alternatively, you can email your suggestions to support@grantadesign.com.