Product Documents (2023-05-15)

pCon.planner – Features in Acoustics Plugin 1.3

Content

1   Introduction

The acoustics plugin is a tool you can use to visualise the acoustic properties of objects and materials in your design and then to edit them. It integrates into pCon.planner, thus considerably extending the program's functions. The tool will extract the details of a design which are necessary to an assessment of the acoustics in the room and will export them into the computation sheet supplied with the program. The calculations give the frequency-dependent reverberation time: when it is known it will be shown diagrammatically. The computation is an approximation which does not take account of the spatial distribution of the objects in the room but will, nonetheless, be a respectable assessment of its acoustics.

2   How it works

Crucial to the acoustic quality of a design are the absorption surfaces and absorption properties of the architectural elements and furnishings contained. Only a subordinate role is played by the shape and structure of these surfaces. It is also acceptable to neglect objects with very small surfaces and only a small acoustic effect. This means that the program will reduce complex objects to a simplified representation for acoustic purposes.

Detailed 3D design (left) and simplified acoustic representation (right)

For all architectural elements, such as walls, floors, ceilings, windows etc., pCon.planner will automatically create a simplified model composed of surfaces. As changes are made to the architectural elements, the model will adapt dynamically. The default material assigned to the surfaces is always one with poor absorption qualities, such as reverberant concrete.
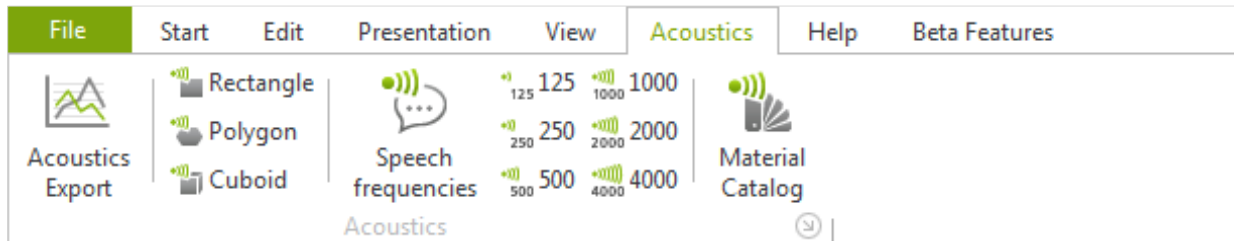
The manufacturers ensure that the data for OFML articles are available in the program with both their simplified acoustic representation and the absorption qualities of their materials. For any other sort of object, the acoustics plugin provides additional functions to enable their acoustics to be represented. The *Material Editor* can be used to design materials and set their absorption.
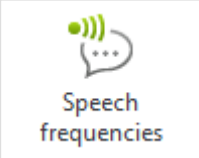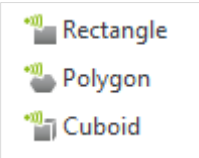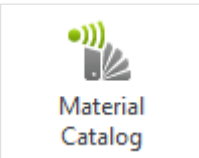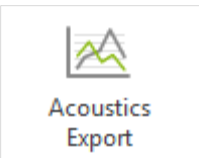

3   Integration into pCon.planner

The acoustics plugin is distributed, installed and licensed separately from pCon.planner. It needs pCon.planner as the basic system. It will integrate with the user interface, extending the range of functions.

4 Extension of the GUI

A new *Acoustics* tab will be added to the pCon.planner ribbon and on this will be found the functions of the acoustics plugin. The *Material Editor* will also have an *Acoustics* category added, so that it will be possible to assign absorption properties to materials and to change these.

Function	Description
	These buttons are for switching from real-time rendering of the active viewport to acoustics mode. There is a choice of octave mean frequencies - 125, 250, 500, 1000, 2000 and 4000 Hz. The next section provided more details on the acoustic mode.
	As well as the individual acoustic modes for each octave mean frequency, there is a further mode which represents the mean for the absorption properties of the four frequency bands in the human speech range (250 Hz – 2000 Hz).
	These buttons are for creating geometric primitives which will serve as simplified acoustic representation of the relevant object. The shapes will be automatically situated on the correct layer.
	This button is the one which starts the integrated browser and the online catalog containing special acoustic materials.
	This function is for the export of acoustics data, which can appear in either a CSV file or an Excel-based sheet. For the latter option, MS Excel will start automatically, opening the relevant style sheet.

5   Acoustic Mode

The acoustics mode is for rendering and editing the acoustic data in a design. All 2D and 3D shapes of objects in the design will be rendered as wireframes in this mode. Acoustic representations are colored. The color symbolises the degree of absorption of a material relative to the octave mean frequency which has been selected. For each viewport, the frequency to be rendered can be set using the menu items on the *Acoustics* tab.
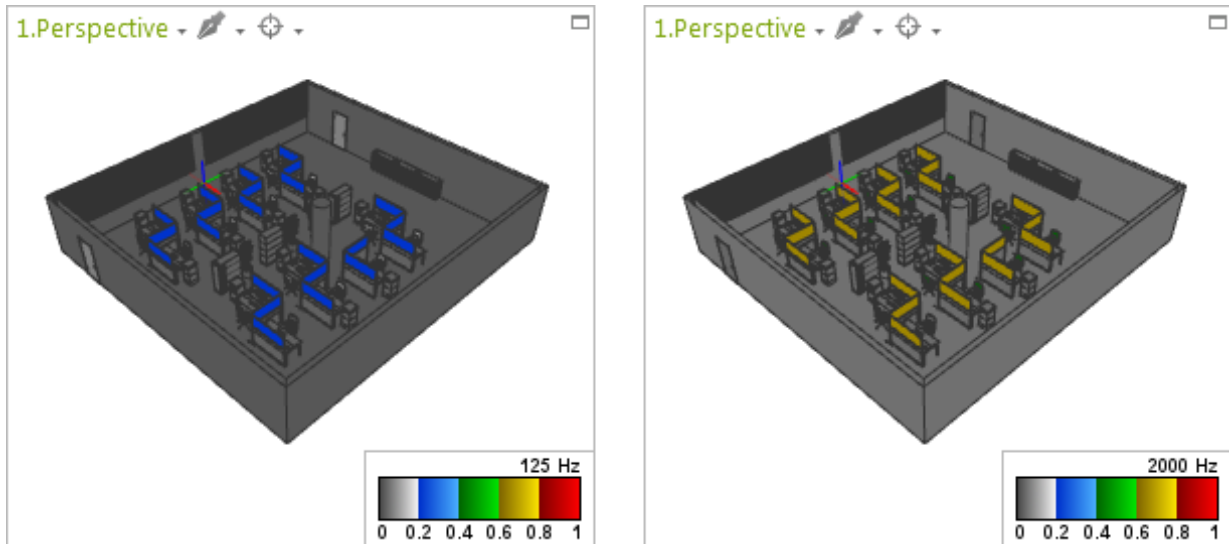

A two-window view of a design, shown in acoustics mode for two different frequencies

Acoustic mode makes it easier to identify acoustically relevant objects and to make a visual assessment of their acoustic effect. As a result, the potential for optimizing the design for the various frequency bands can be seen at the design stage and unfavourable spatial acoustics are avoided.

> **PLEASE NOTE:** The acoustic mode will stay active even if you open a new file. In order to leave the acoustic mode, please follow the following instructions: Make sure that the viewport that is in acoustic mode is currently active. Then, switch to the *View* tab and simply set another *Render* mode for the viewport.

6 Assigning absorption properties
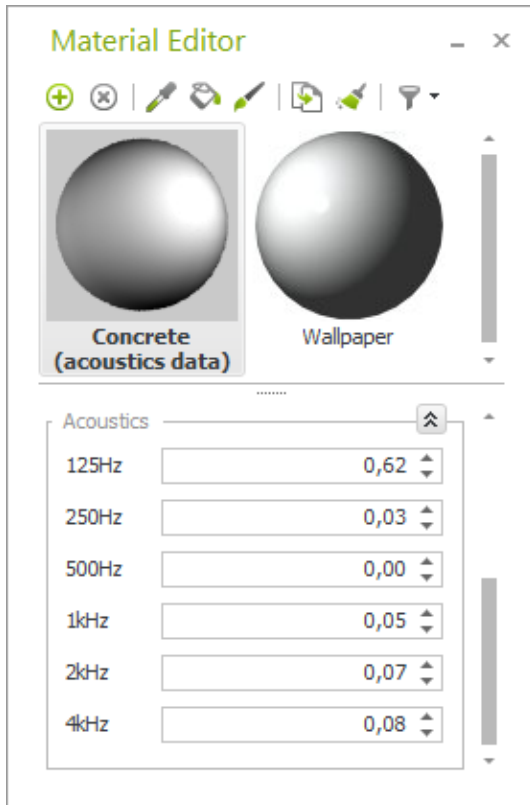
Fields for entering acoustic absorption properties in the Material Editor

Another function of acoustics mode, besides the visual rendering itself, is its use in efficient editing of the acoustic details for a design. It will largely be used for creating, editing and assigning materials which have absorption properties.

In the pCon.planner *Material Editor* there is now the new *Acoustics* category which contains 6 fields for the octave frequency bands. This enables the desired values to be entered for each material.

The surfaces with acoustic properties are rendered with a filling if acoustics mode is on, and enable the paint bucket to be used so that a new material can be assigned.

Using the pipette it will be possible to find materials in the *Material Editor* which have already been assigned, and to edit them. Any modifications will take instant effect in the design and will be visible on screen.

In an online catalog, there is also a selection of pre-defined acoustic materials available which are conventional for interior spaces. The catalog is called up on the integrated browser by means of the new *Material Catalog* button. All the materials possess acoustic absorption values which are visualised in the preview images. The paint bucket symbol is used to start assigning the materials.
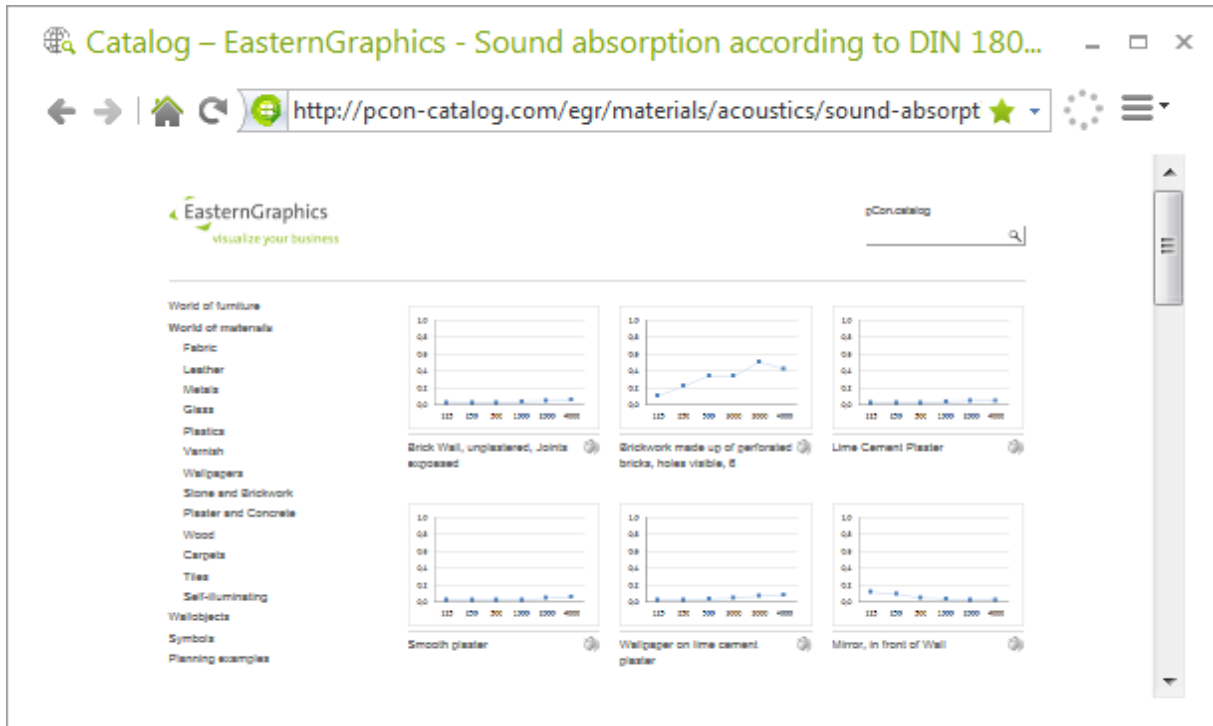
Preview images of a variety of acoustic materials in the online catalog

PLEASE NOTE: Any materials used in the design can be provided with absorption values. However, the materials will be disregarded by the acoustics plugin unless they have been assigned to an element in the simplified acoustic representation.

7   Creating a simplified acoustic representation

When the acoustic data is exported, objects which have not been provided with an acoustic representation, like for example 3D Warehouse symbols, will not automatically be taken into account. If you want them to be included in the export all the same, it will be necessary to make a simplified representation of the object. There are three special geometric primitives in the plugin for this purpose: *Rectangle*, *Polygon* and *Cuboid*.
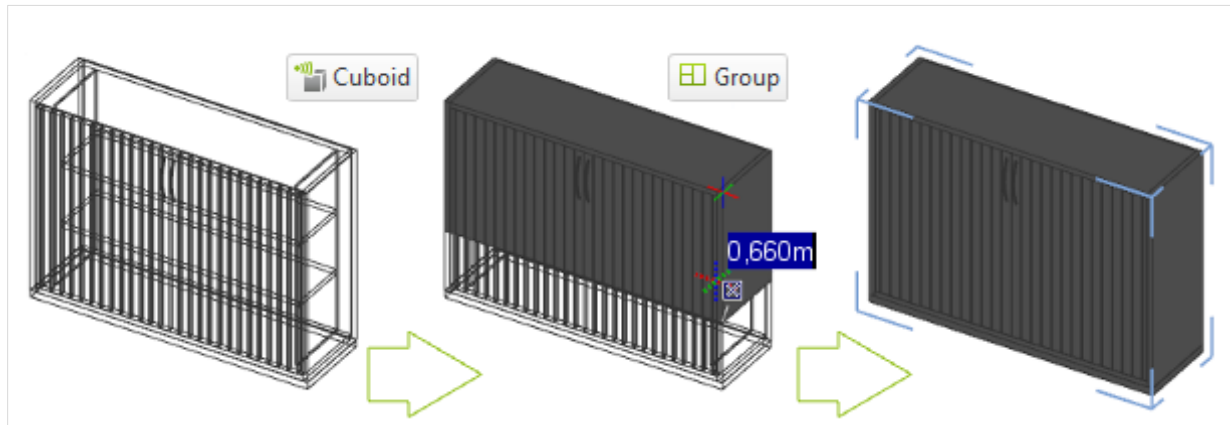

When the simplified representation has been created, it should be grouped together with the 3D shape of the object (*Edit* tab, *Group* function, or keyboard shortcut **CTRL+G**). Linking the two shapes has the effect of allowing the object to be moved and rotated in all rendering modes without the procedure having to be repeated in each different mode.

8   Exporting the acoustic data

The *Acoustics Export* serves to extract acoustically relevant details from the design, such as the surfaces of the absorbers, the absorption properties of the materials and the volume of the room. The first step is to select a room.

The floor area of the room is multiplied by the mean height of the walls enclosing it to give the room volume. The mean height of the walls also serves as a virtual cut-off level. Acoustic surfaces which intersect the cut-off level (e.g. roof pitches) will be cut so that only the parts in the room volume are regarded.

In addition, the export will also check whether both a ceiling and a floor have been inserted to the selected room volume. Both these elements are of significance for the room acoustics and both are needed for the calculation of the reverberation time. If one of them is missing, a message will appear. There is the option of letting the ceiling or the floor be completed automatically. This will only happen in the export: it will not have any effect on the content of the design.
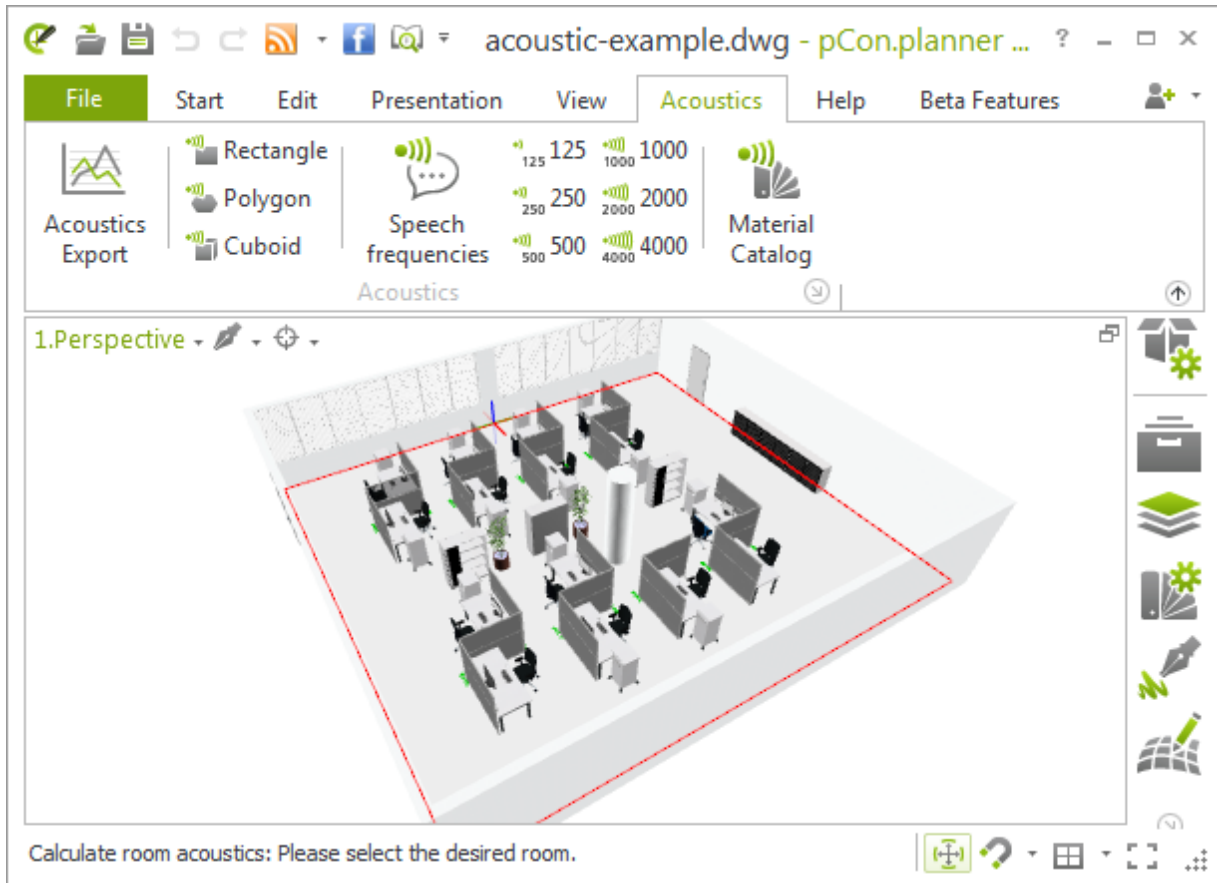
Selecting a room during acoustic export (framed in red)

The next step is to select where the file being exported is to be saved, and which export format is desired. The following formats are available:

Format	Description
*.csv	The acoustic details are exported in the form of a CSV table. There are additional codes in the file for structuring purposes and for the unique identification of the data sets, which will permit efficient editing in downstream systems.
*.xls / *.xlsx	Here the acoustic details are exported directly into the ready-made Excel calculation sheet and then Excel is opened automatically. To export into Excel format, it will be necessary to have MS Excel installed on the computer.

The acoustics plugin contains a default calculation sheet for MS Excel and this is used when XLS format is selected for the export.

It is possible as an alternative to use individually prepared templates in the form of XLT/XLTM files. These can be selected in the *Acoustics Settings* dialog for the acoustics plugin and established as reference template.
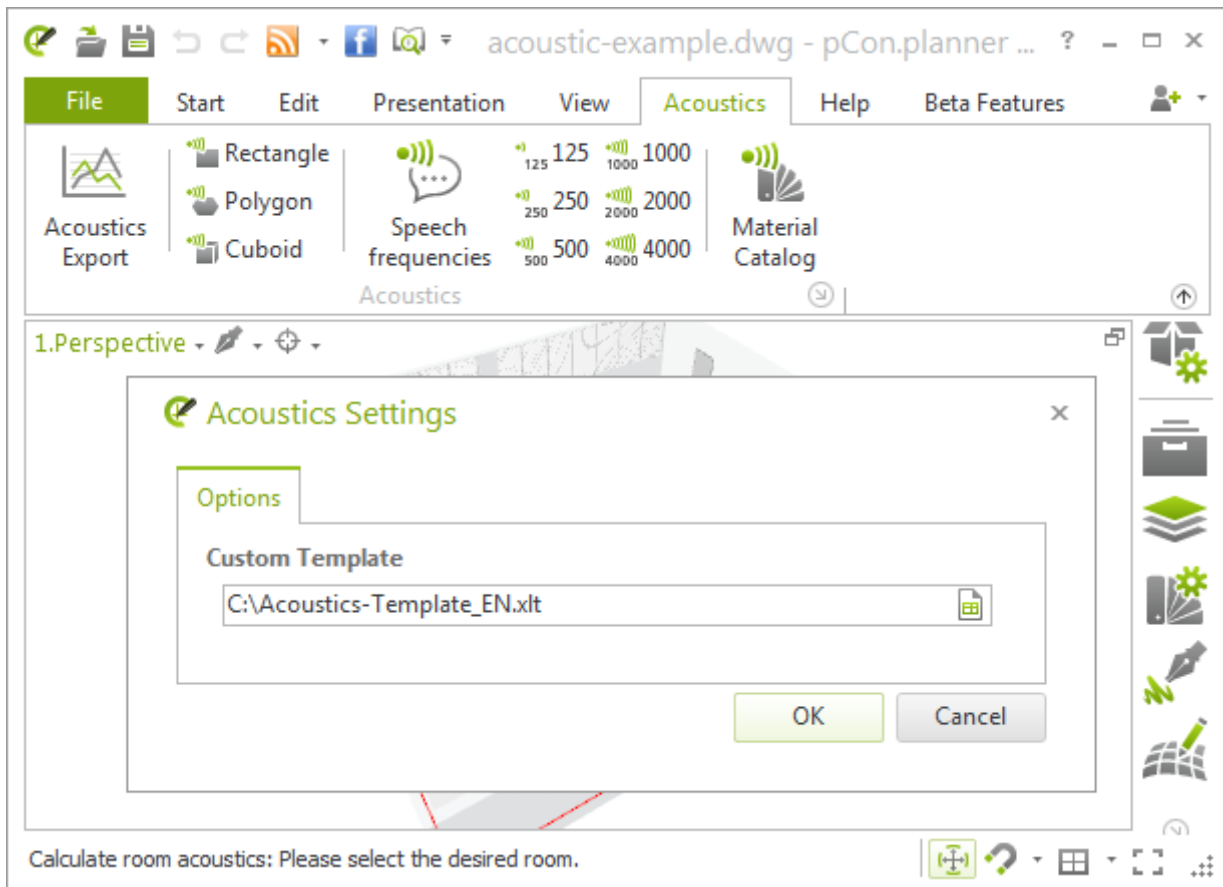
If the path details are deleted, the default calculation template supplied with the plugin will be used.

All the simplified representations of all the objects contained in the room selected will be computed for the export. The surfaces will be added together if the material assigned and the object category (like architectural element or furnishing) are the same. The result will be a list of absorbers. It will contain all the totalled-together surfaces and their absorption properties.

Not only the acoustic data but also the project details will be exported. The latter are the details specific to the particular design and include, for example, project names or object details and/or the commissioning party (all of which details that can be entered under *Document Properties* in the application menu of the pCon.planner).

The form in which the acoustic data and project details will be displayed in the Excel computation sheet will depend on the design of the template being used. The image below shows the calculation carried out on the default form supplied with the plugin.

Evaluation sheet showing sample values, using the default calculation template supplied with the plugin

Legal remarks