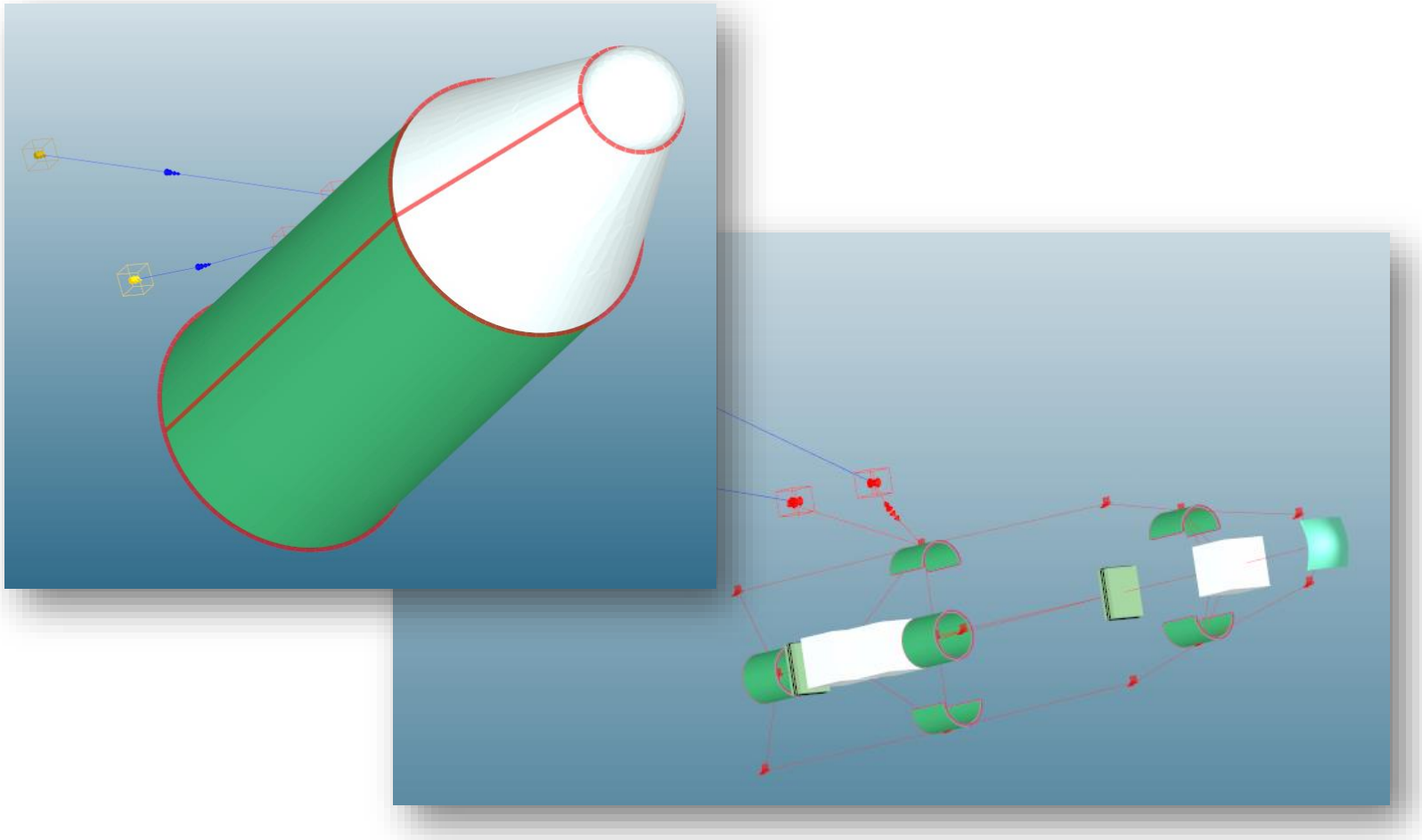
SEA+/SEA-Cyl

Application to Sound Reduction



InterAC
Ingénierie Technique & Recherche en Acoustique
Technical Engineering & Research in Acoustics

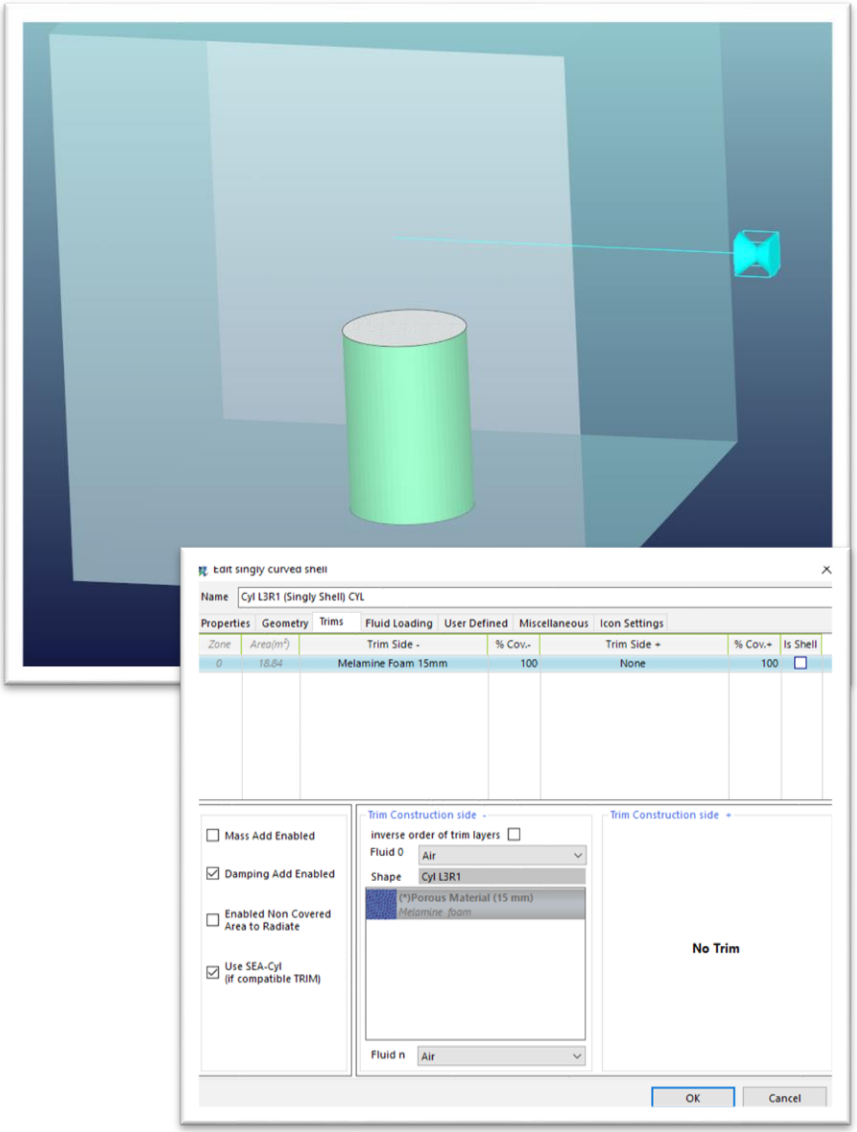
Acoustic Treatment of Cylindrical Structures

- Predicting performance of sound insulation packages, applied to curved structures in mid & high frequency ranges, is improved thanks to SEA-Cyl*, a newly introduced calculation module of SEA+
- SEA-Cyl performs all TMM** computations expressing acoustic trim layers & master structure in cylindrical coordinates
- Within one click, it is possible to switch from TMM calculation in planar configuration (classical case) to full cylindrical configuration
- Curvature is known for changing radiation properties of structures but influences also the transmission properties of trims and their effect on master structure, taken into account in SEA+

- Next example demonstrates how a single layer of porous material may considerably change the transmission behavior of an aerospace structure whether its dynamic behavior is computed in planar or curved configuration
  - (*) SEA-Cyl is developed by CSTB
  - (**) TMM (Transfer Matrix Method): classical method to compute transmission through various acoustic layers (the trim, generally modelled in planar configuration) applied to a supporting structure modelled in the SEA frame work with the appropriate geometry

Transmission in a Cylindrical Structure

- A CFRP sandwich structure (with aluminum honeycomb core) is submitted to the pressure field of a reverberant room as shown in right picture
- On the internal face of the cylinder is applied a porous layer (melamine foam, 15 mm-thick)
- Next slide shows sound performance of the trimmed cylinder by activating or not SEA-Cyl



Acoustic Performance with and without SEA-Cyl

- Mean SPL in internal acoustic cavity is predicted in SEA+ with & without SEA-Cyl activation (source pressure is constant 94 dB SPL in reverberant room)
- SPL drops of -4 to -5 dB are found above 250 Hz when activating SEA-Cyl
- The drop is mainly due to an increase of added damping from melamine layer to the master structure as melamine is submitted to much more shear in curved conditions correctly described by SEA-Cyl (see right bottom picture)
- Thus, predicting full trimmed structures with SEA-Cyl opens new territories for optimization with curved geometry (cars, aircraft & spacraft, ships..;)