

Passive Scalars

Passive scalars are user-defined variables of arbitrary value, assigned to fluid phases or individual particles. They are passive because they do not affect the physical properties of the simulation. An intuitive way to think of passive scalars is as tracer dye in a fluid, but with numerical values instead of colors, and with no appreciable mass or volume.

More elaborate physical effects can be modeled with passive scalars, by careful definition of the source terms, for example, change of composition through radioactive decay. To understand the transport equation that is modeled, see [Passive Scalar Transport](#).

You can use more than one passive scalar in a simulation. The following situations are examples where this capability can be useful:

- Choosing the best position for a sensor while designing a part with multiple inlet pipes and an exhaust pipe.

You can use the passive scalars to check the scalar values at discrete points in the computational domain. Then you can determine which of the scalars sends the strongest signal to the sensor.

- Analyzing the mixing of two fluid streams that have the same properties.

The fluid is represented as single-phase, but you can use multiple passive scalars to examine the effect of mixing.

- Tracing how smoke or any other vapor would convect and diffuse in a room or any fluid domain.

More specifically, you can model the dissolution of a gas in a liquid.