Exit Age Distribution

* E, exit age distribution, is the normalized residence time distribution
* The fraction of the flow exiting the reactor at a given time is described by the E(t) curve.
* Normalized relationship is represented by ∫0∞**E**dt = 1
* Note: the units of E are time-1
* ∫0∞**E**dt = Percentage of flow at time t has exited reactor by time t
* Edt = Percentage of flow exited reactor between time t and time t + dt

Reynold’s Number:

* < 2100 = laminar flow
* > 2100 = turbulent flow
* Smaller tubes = smaller number
* Smaller velocity = smaller number
* More viscous fluid = smaller number

E(t) vs. F(t) Curves

* F(t) curves can be thought of as the percentage of the flow leaving the reactor at a time t that is younter than time t.
* Mathematically, the E(t) and F(t) curves are related by **F** = ∫0t**E**dt, d**F**/dt = **E**
* Because the derivative of F(t) equals E, a steep slope in an F(t) curve will correspond to a peak in an E(t) curve
* Inflection point on F curve is peak on E curve
* Flat region on F curve is valleys on E curve
* F varies from 0 to 1

Example 1: E(t) curve = F(t) curve)

* Problem statement: based on the following F(t) curve, predict what the E(t) curve will look like
* [insert pictures from paper notes)

Determining E(t) and F(t) Experimentally

* To analyze the RTD for a particular reactor one must measure the non-ideal flow component, for example by adding a color dye or radioactive tracer
* The tracer component is then measured at the outlet of the reactor by monitoring with nan appropriate sensor (i.e. colorimeter, electrical conductance, emission of β and γ rays, etc.)