# Fluid property blending

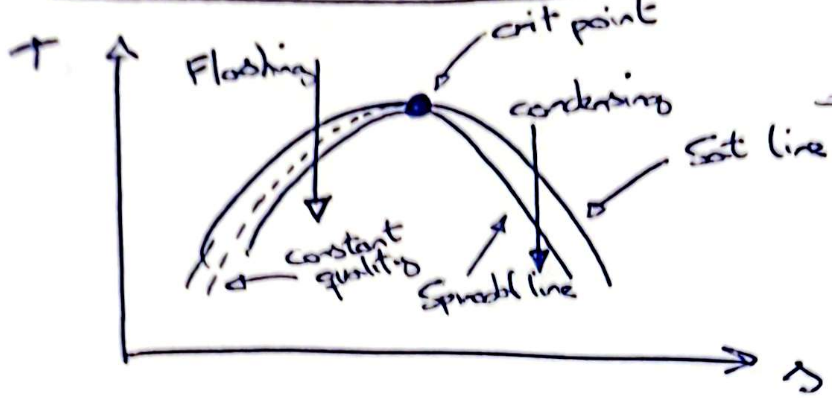
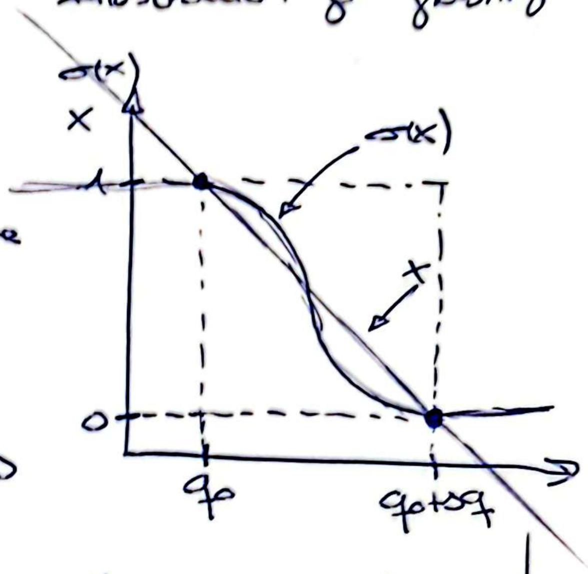



Illustration for flashing




## Assumptions

- There is a Wilson line both on gas-like and liquid-like
- Wilson line is close to quality isoline
- Phase transition starts at $q_{onset}$
- Phase transition to equilibrium is complete at $q_{onset} + \Delta q$
- Before phase transition $\phi = \phi_{meta}$
- After phase transition $\phi = \phi_{equilibrium}$
- During phase transition $\phi = (1 - \sigma(\hat{x}))\phi_{eq} + \sigma(\hat{x})\phi_{meta}$
  convex combination of both.

$\sigma(\hat{x})$ is a smooth blending function such as a Hermite polynomial, also known as smooth-step function. (or smoother second order)

$$\sigma(\hat{x}) = \begin{cases} 0 & x \leq 0 \\ 3x^2 - 2x^3 & 0 \leq x \leq 1 \\ 1 & 1 \leq x \end{cases} \qquad \sigma_2(\hat{x}) = \begin{cases} 0 & x \leq 0 \\ 6x^5 - 15x^4 + 10x^3 & 0 \leq x \leq 1 \\ 1 & 1 \leq x \end{cases}$$

How do we define $\hat{x}$ → As a linear function of quality that satisfies:

Condensation
$q = q_{onset}$ at $x = 1$ (start)
$q = q_{onset} - \Delta q$ at $x = 0$ (end)

flashing
$q = q_{onset}$ at $x = 1$ (start)
$q = q_{onset} + \Delta q$ at $x = 0$ (end)

Overall
$q = q_{onset}$ $x = 1$
$q = q_{onset} \pm \Delta q$ $x = 0$

Making a linear interpolation we find

$$\hat{x} = 1 \mp \left[\frac{q - q_{onset}}{\Delta q}\right]$$

with $\oplus$ sign for condensation, $\ominus$ sign for flashing