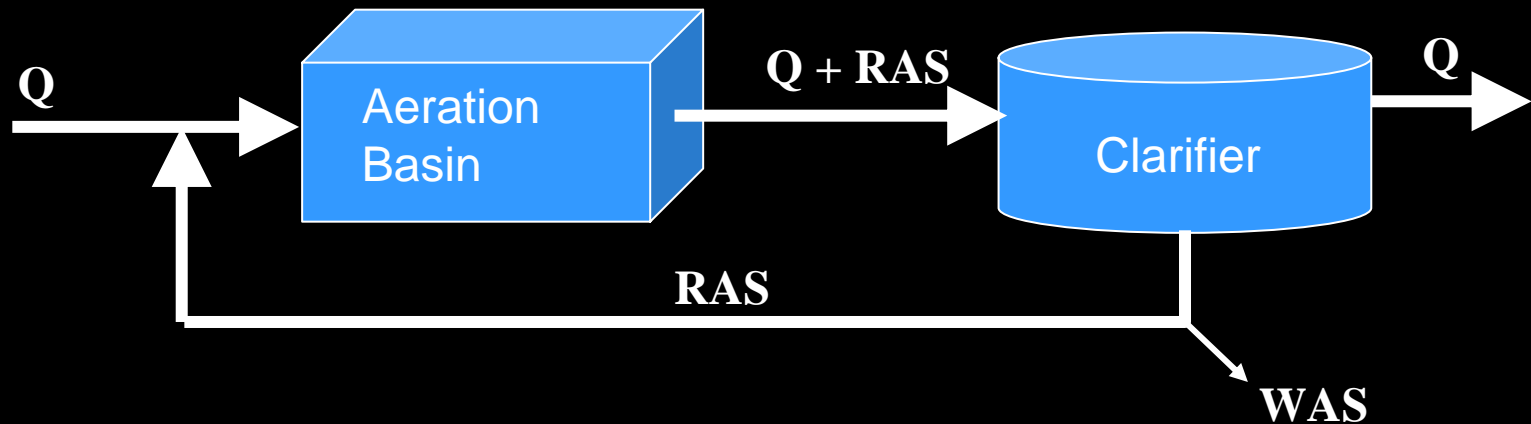


STATE POINT ANALYSIS

WesTech Engineering, Inc.
Salt Lake City, Utah, USA

Simplified Activated Sludge Flow Sheet

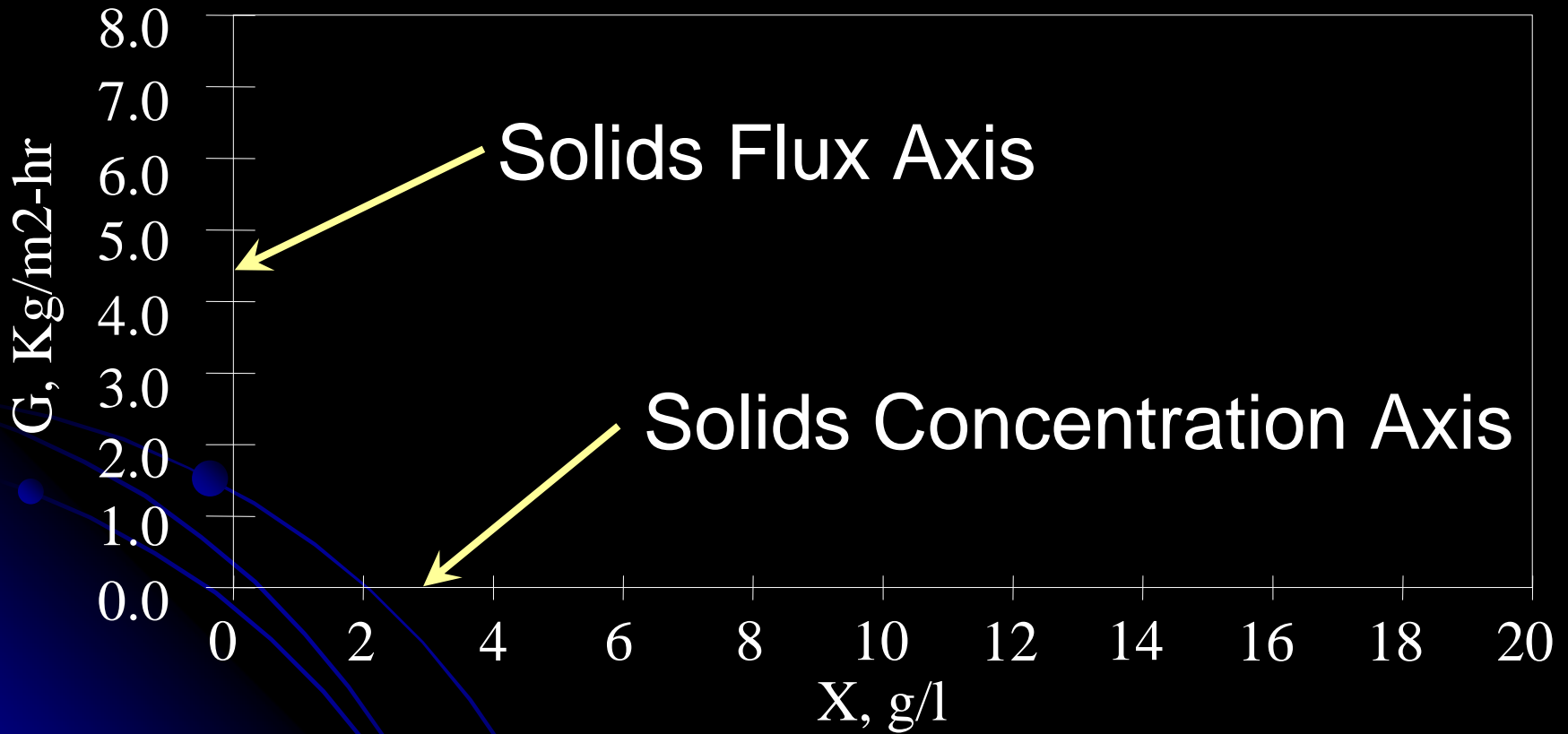


State Point Analysis

Key Parameters used in State Point Analysis

Factor / Parameter	Symbol
● Influent flow rate	Q
● Return activated sludge flow rate	RAS
● Mixed liquor concentration	X_{mlss}
● Sludge settling characteristics	V_o, k
● Clarifier surface area	A

State Point Diagram



What is Solids Flux?

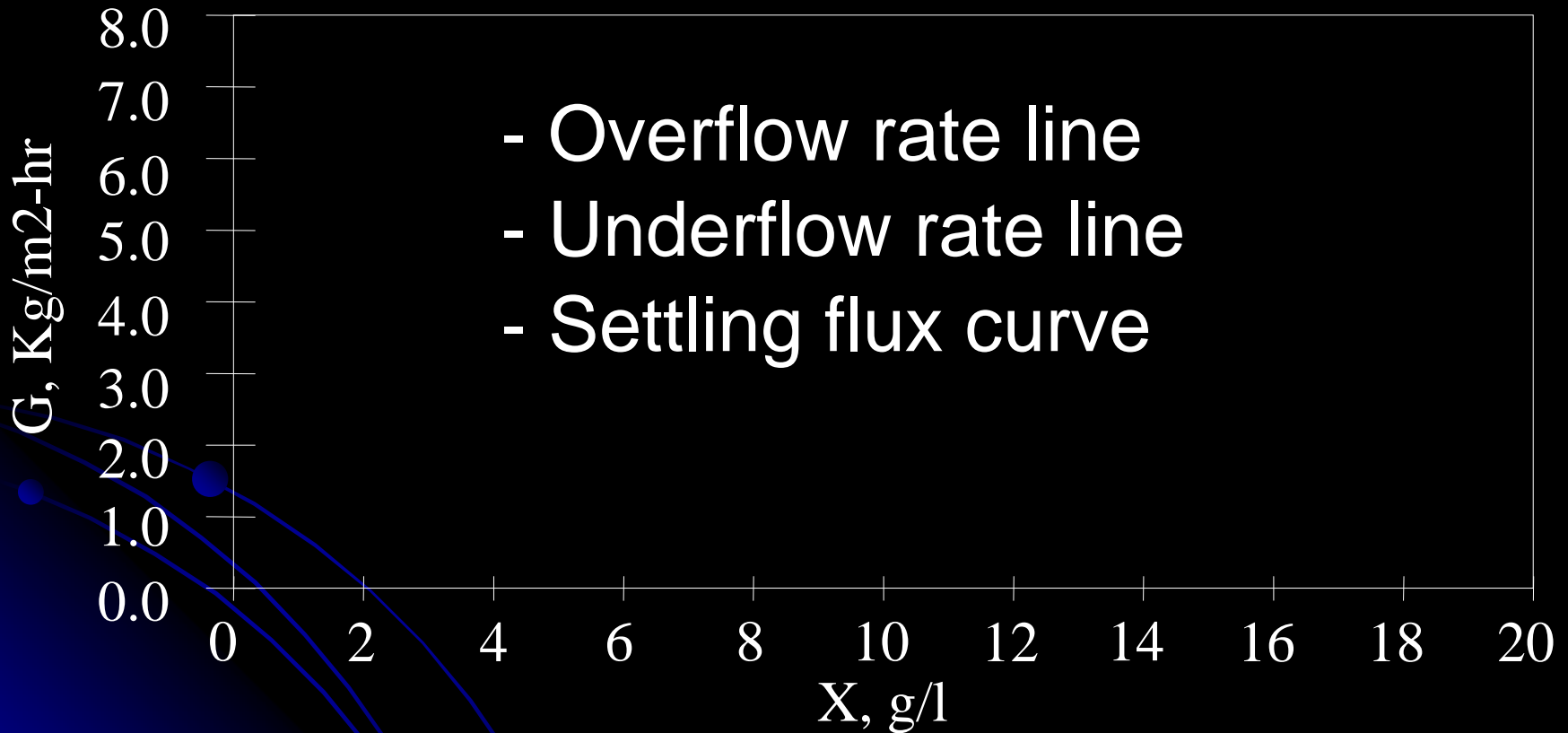
Solids flux is the movement of solids through a clarifier

Solids Flux = mass per unit area per unit time
 $\text{kg} / \text{m}^2 - \text{hr}$

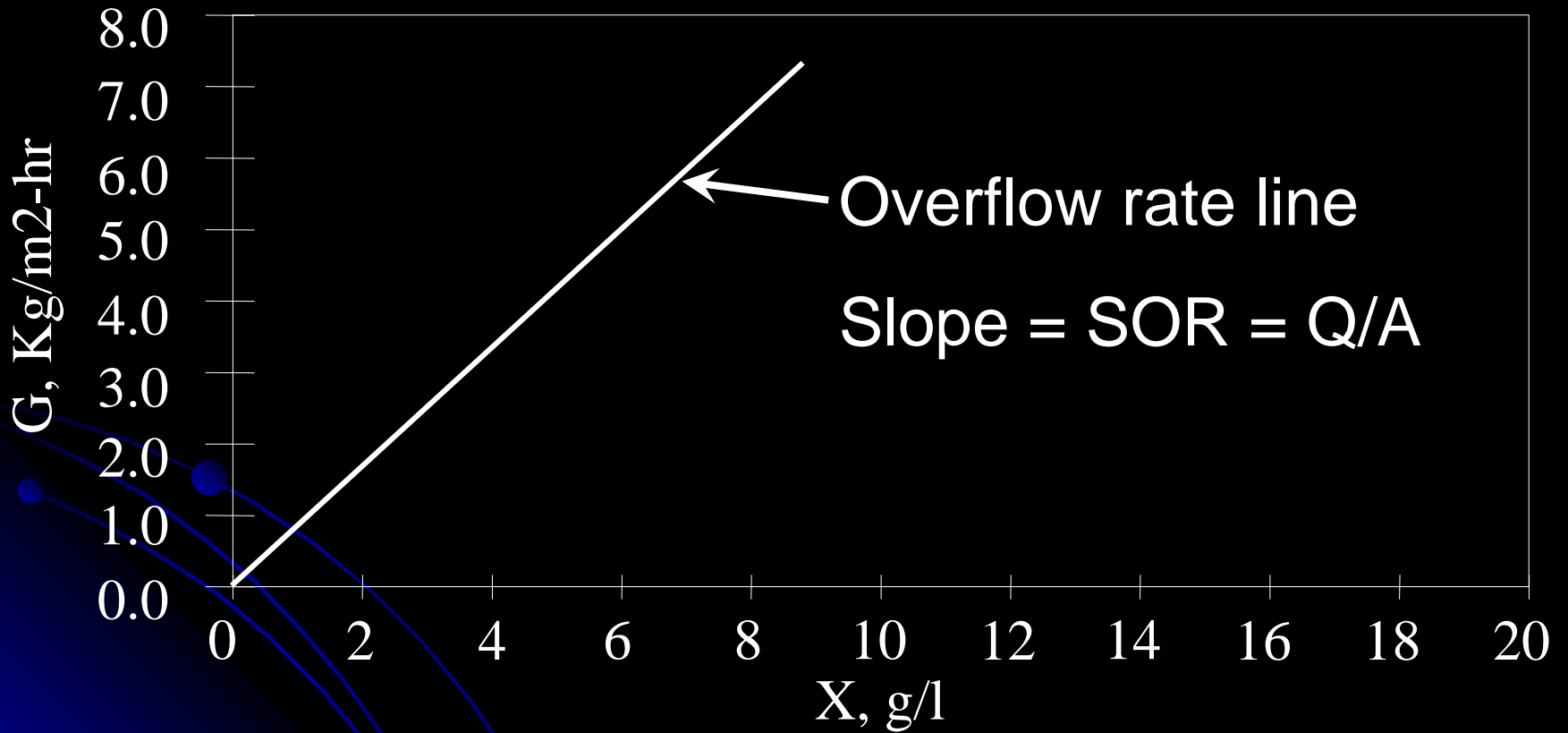
Solids Loading Rate (SLR)
is one type of solids flux

State Point Diagram

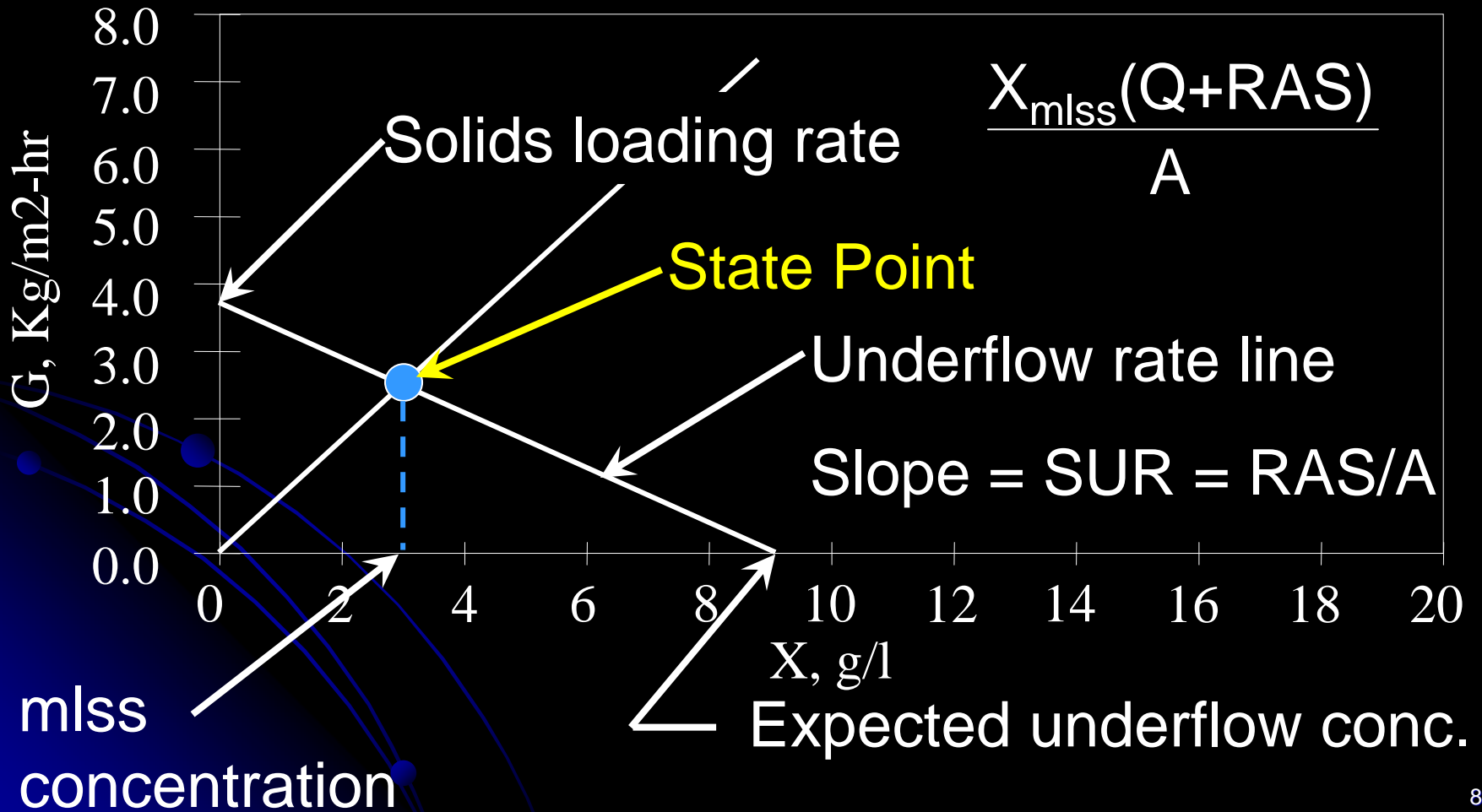
We will plot three elements



State Point Diagram



State Point Diagram



Settling Flux

$$\text{Settling Flux, } G_s = X \cdot V_s$$

Where: X = Solids concentration

V_s = Settling velocity at
that concentration

Determine V_s with settling tests

Settling Flux

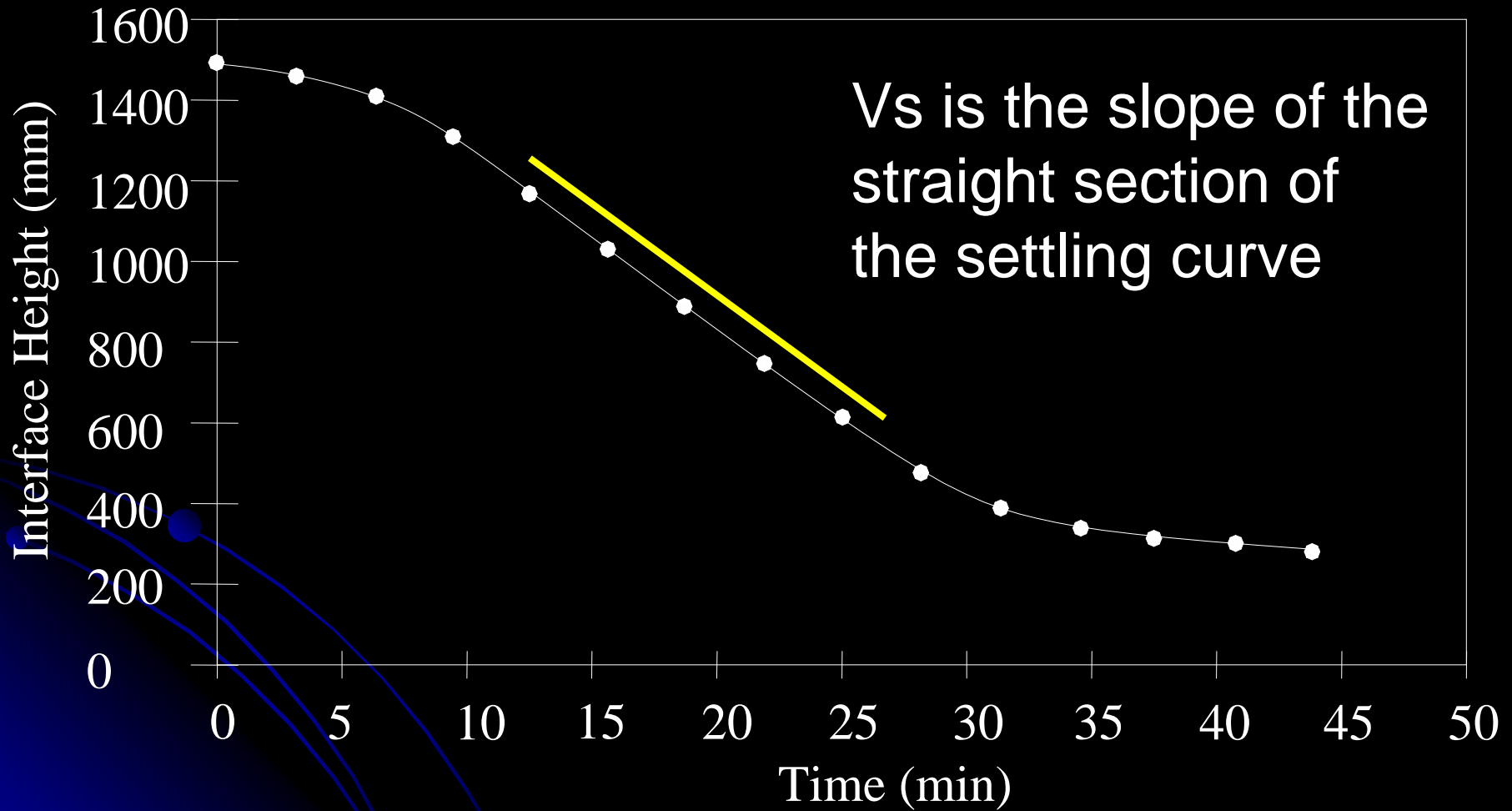
Settling tests at various solids concentrations

Interface height

We record
interface
height
vs
time



Settling Curve



Settling Flux

Now that we have the settling velocity V_s we can calculate G_s

$$G_s = X \cdot V_s$$

This gives us one (1) point on the flux curve.

To get more points we need to run more tests at different solids concentrations.

Settling Flux

For most activated sludge there exists the following relationship

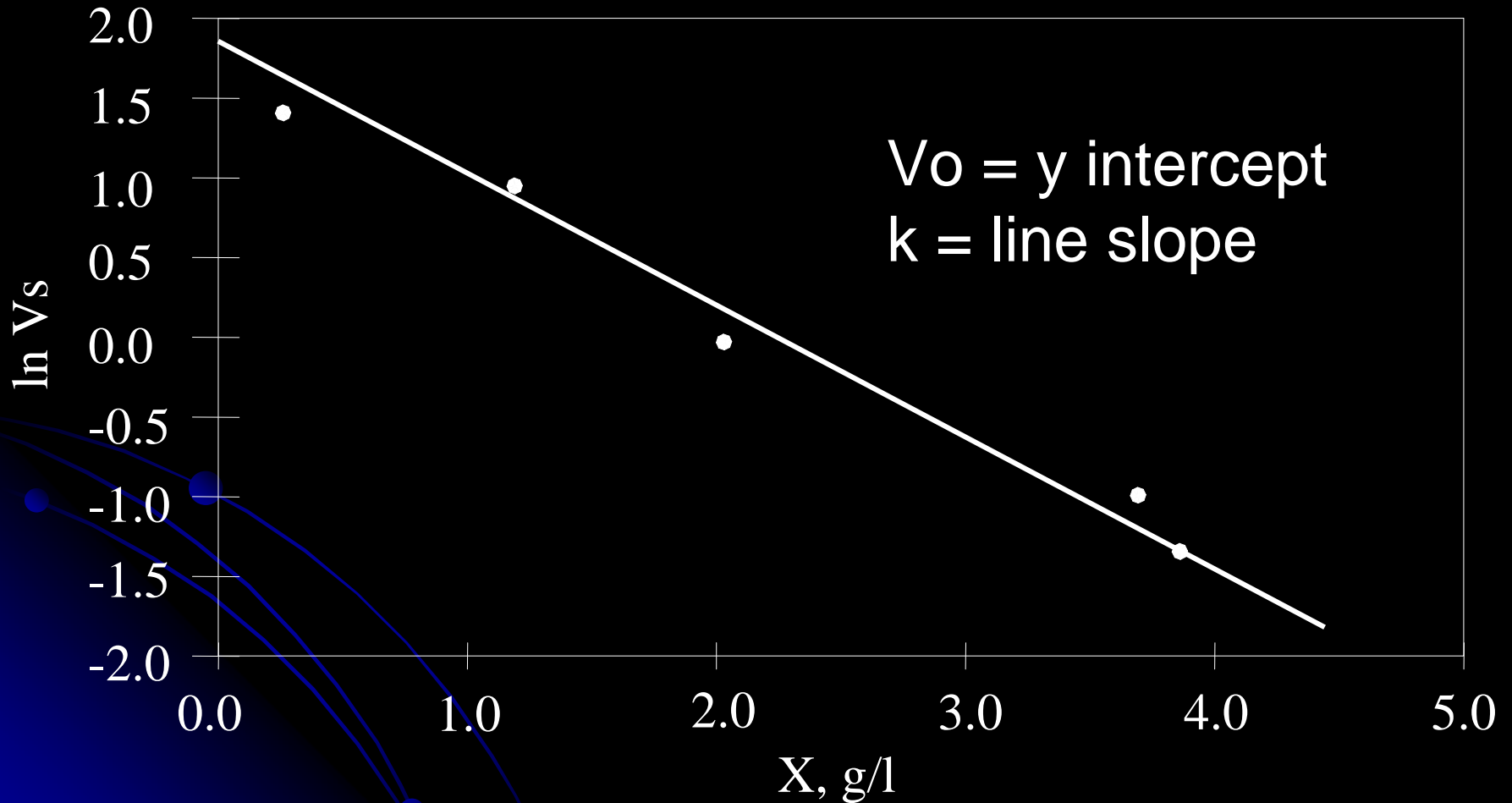
$$V_s = V_o e^{-kX}$$

Substitution gives

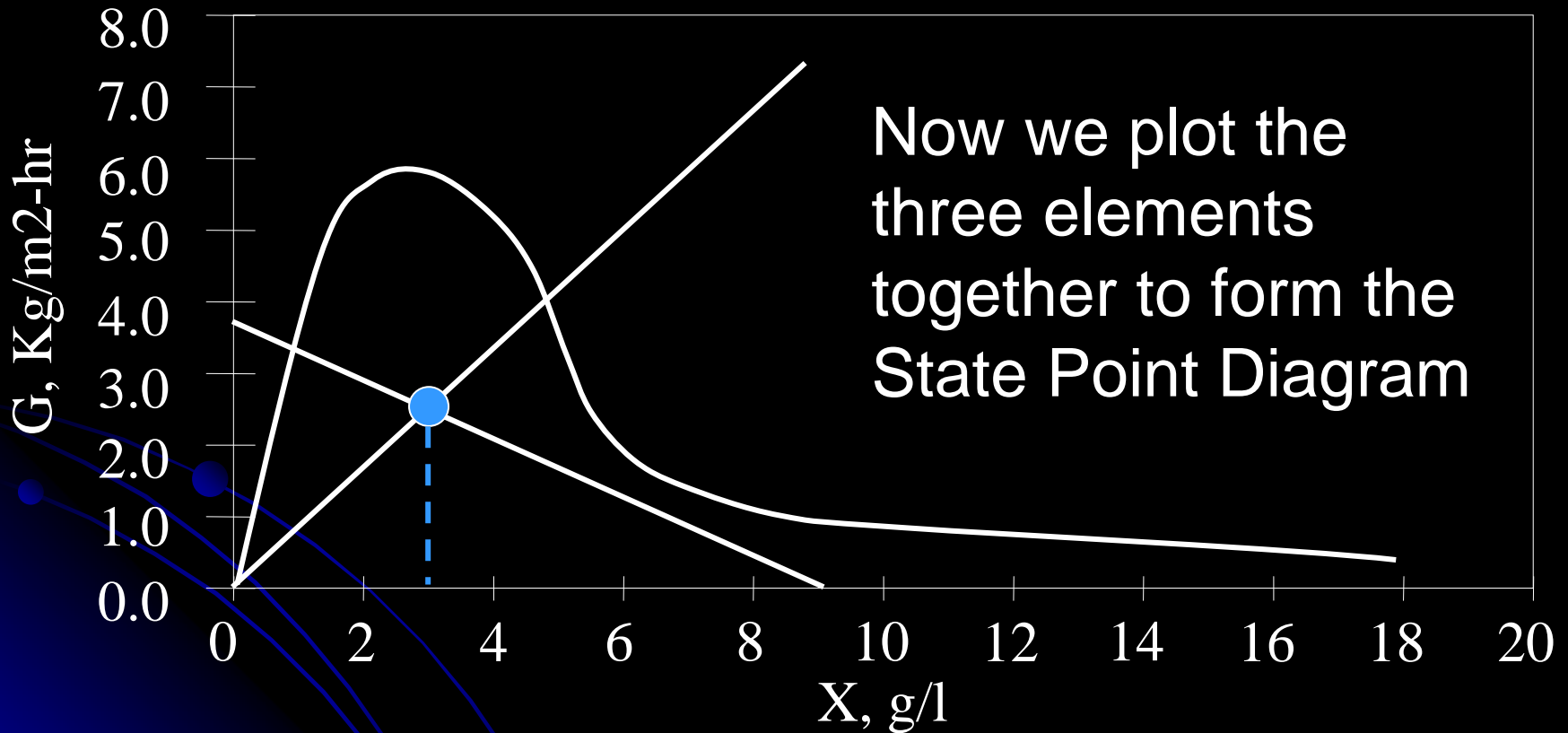
$$G_s = X \cdot V_o e^{-kX}$$

With a few settling tests we can solve for V_o and k and define the whole flux curve.

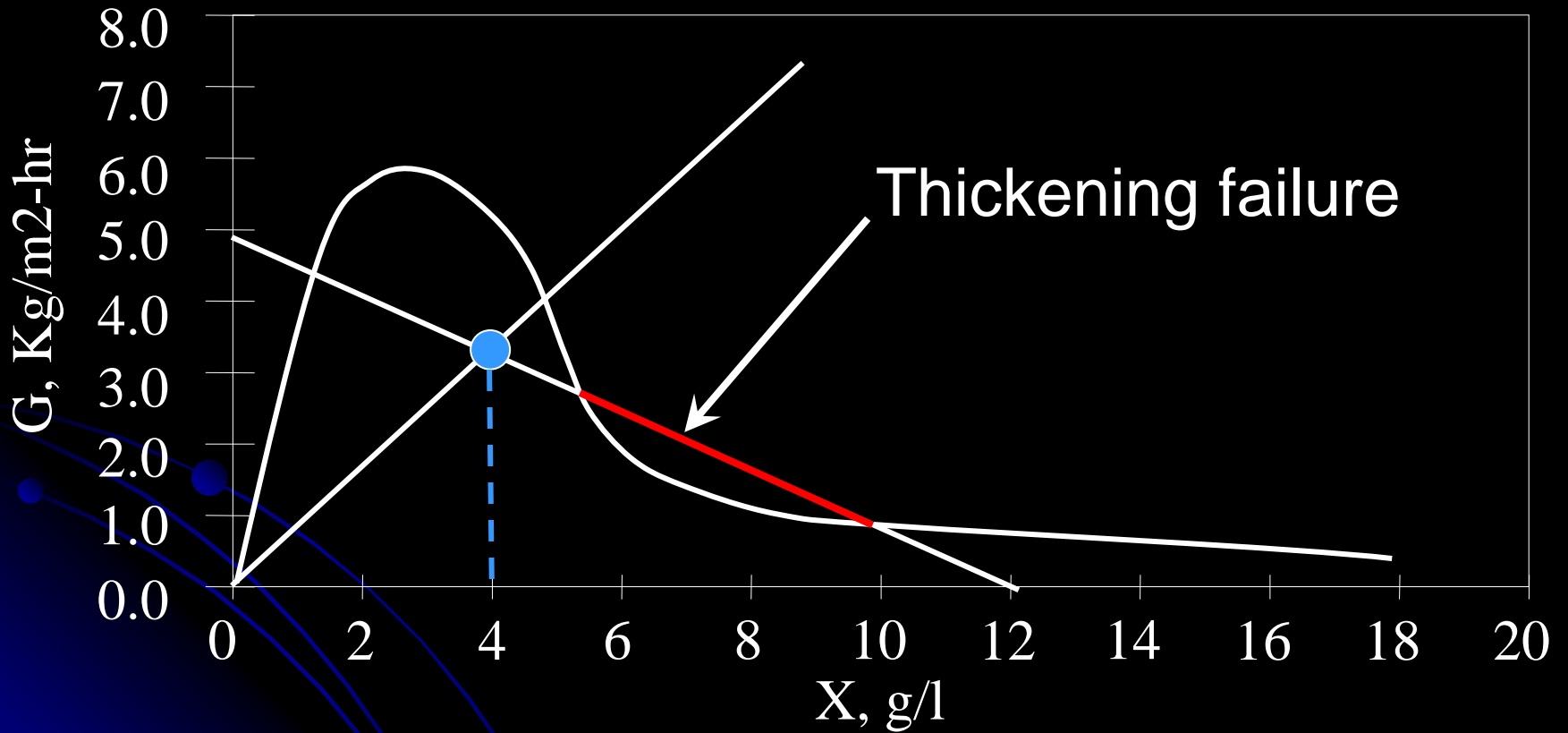
Veslund Relationship



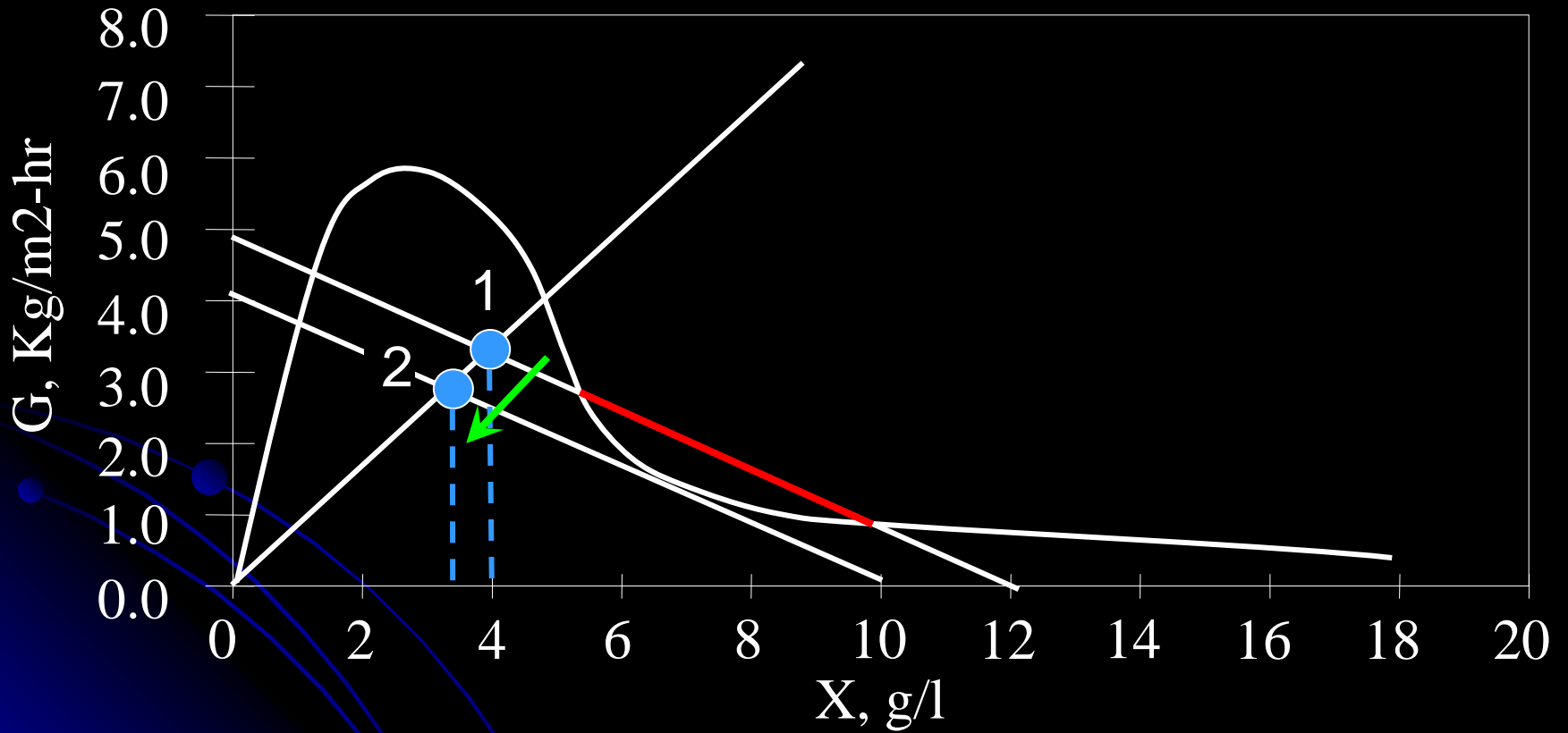
State Point Diagram



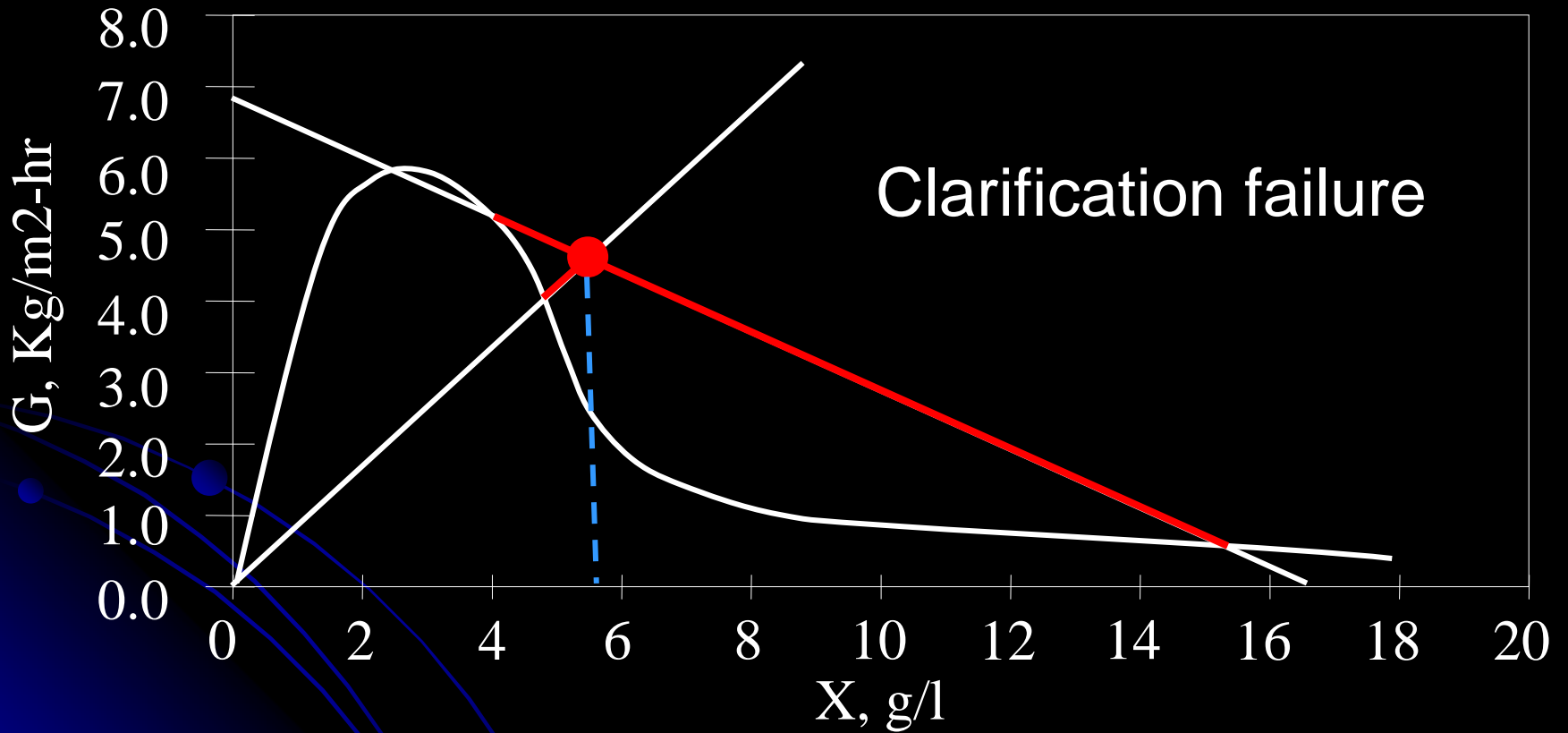
Thickening Failure



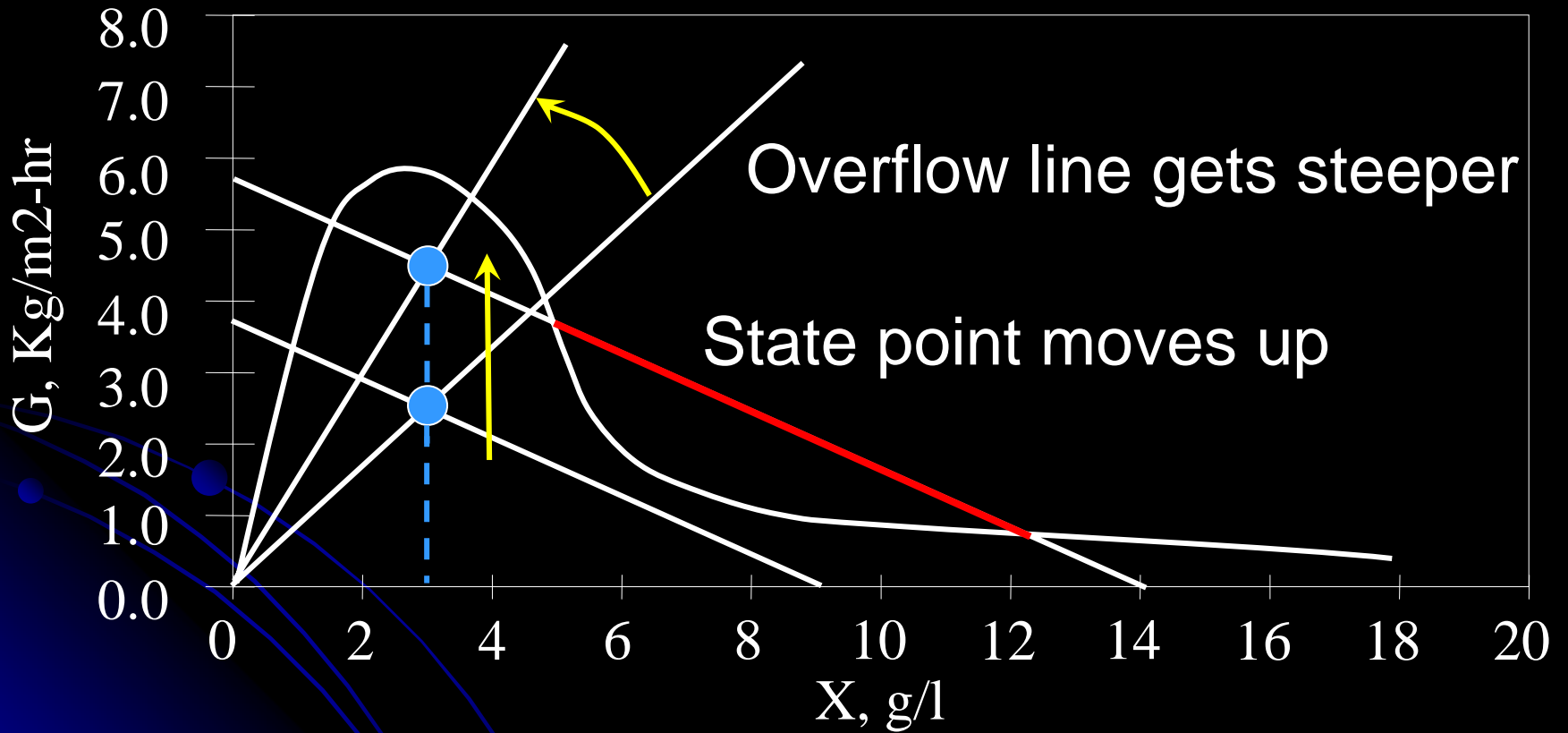
Inventory Shift



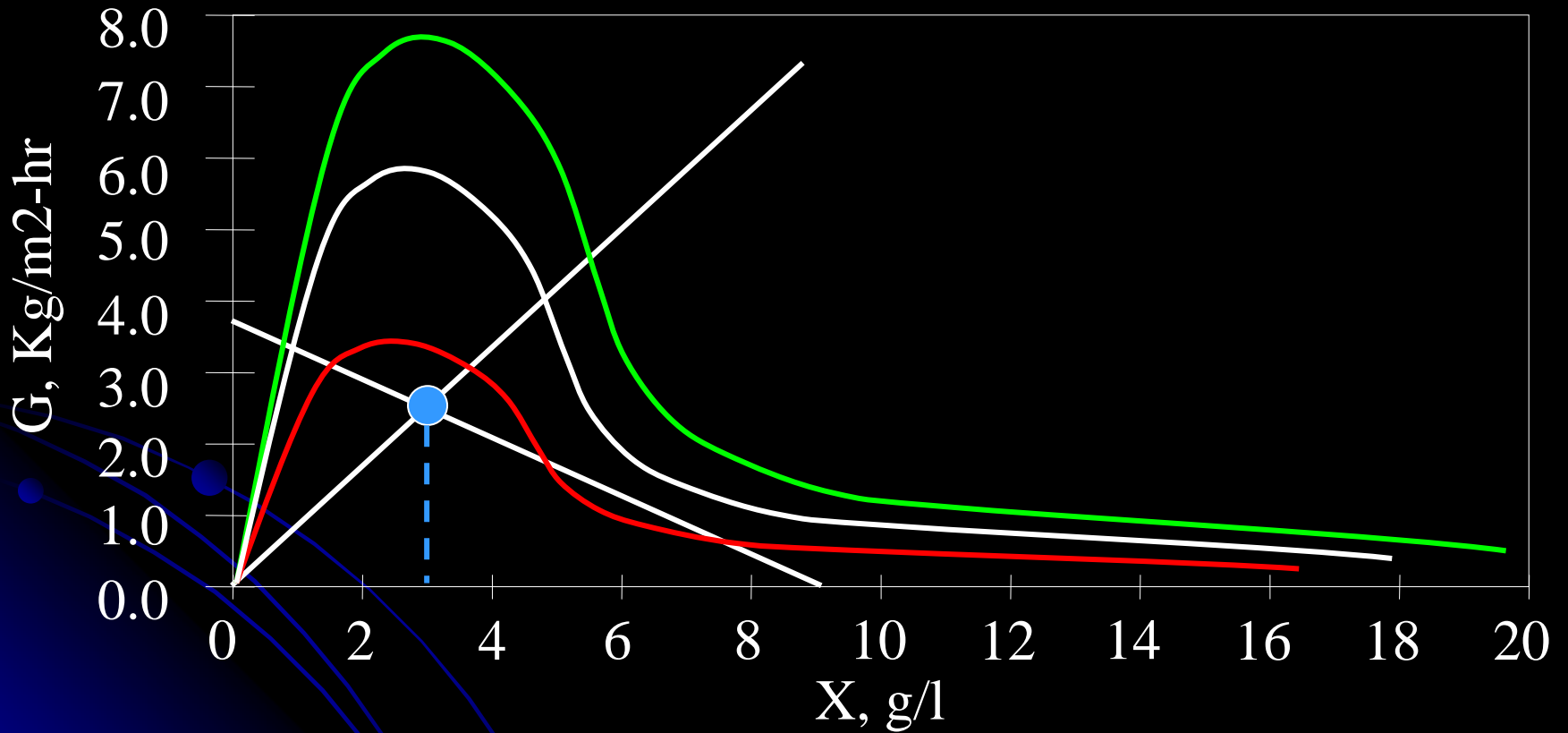
Clarification Failure



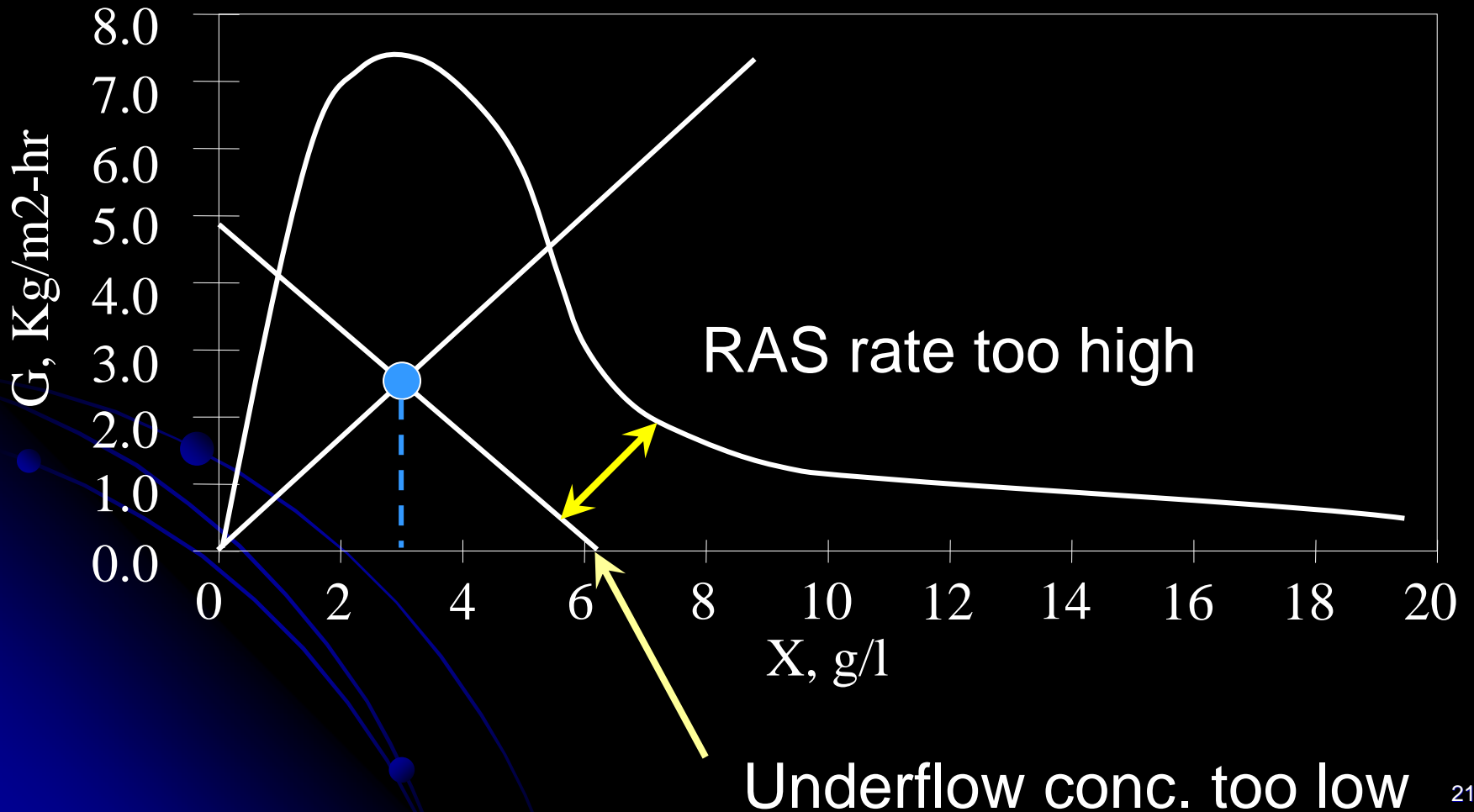
Flow Increase



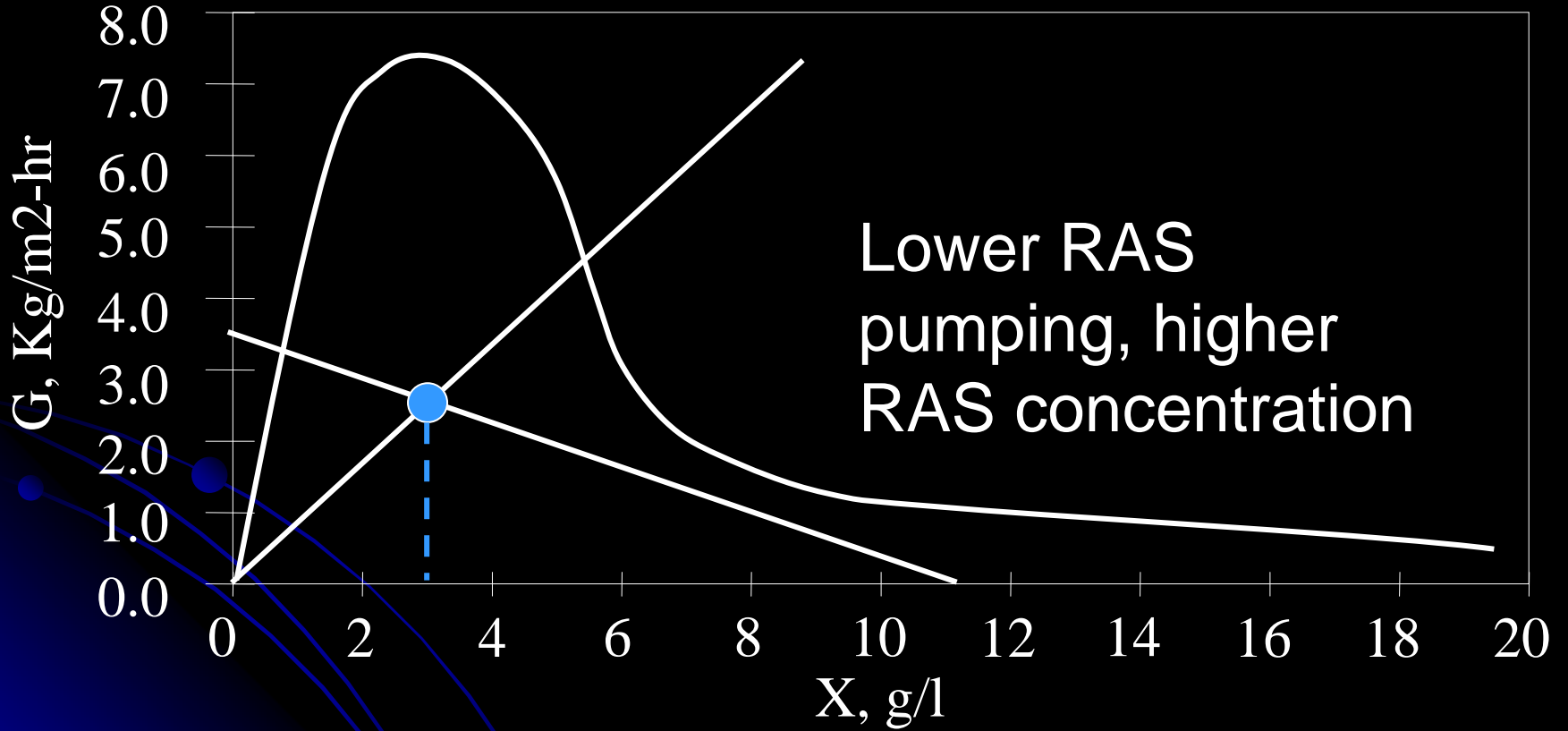
Change Settling Properties



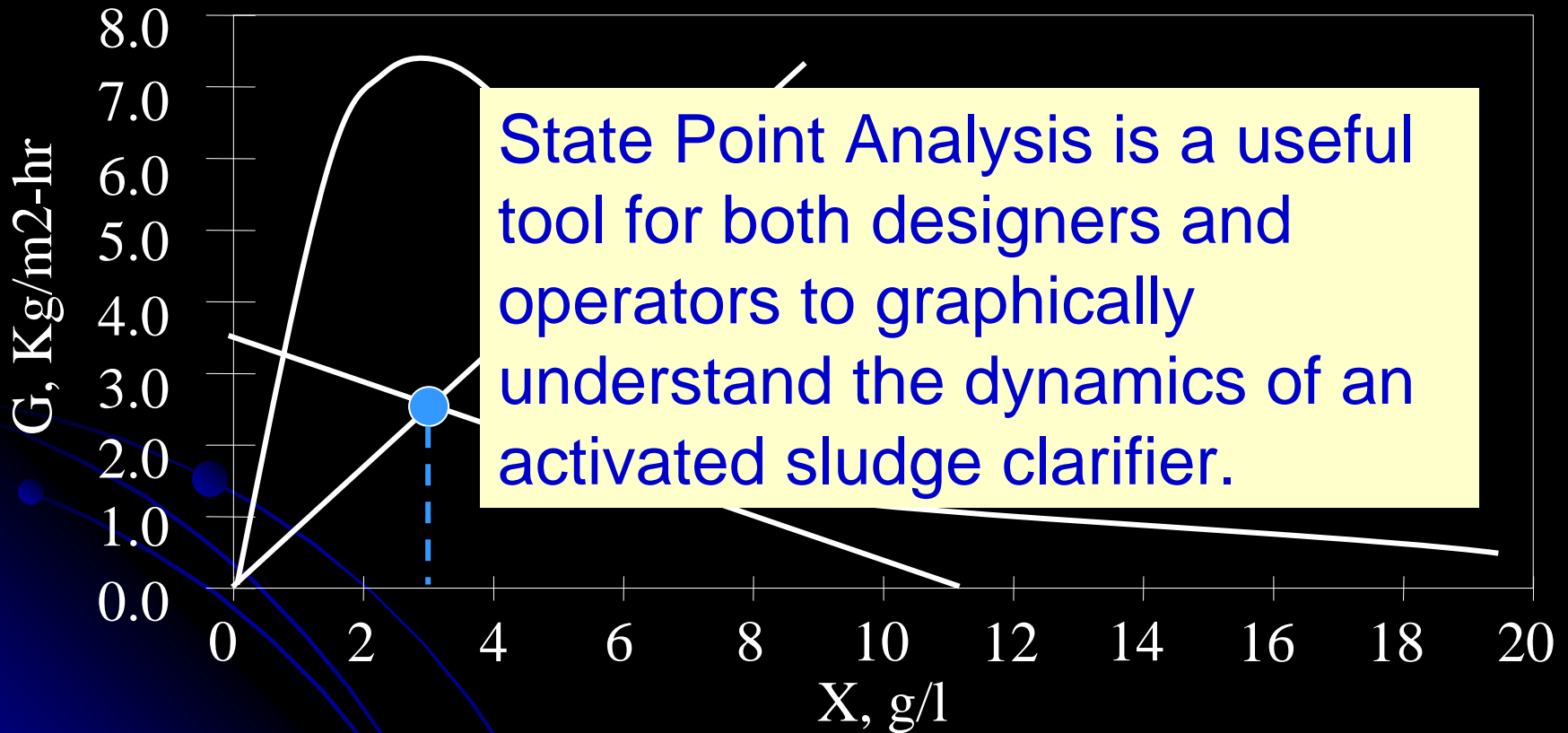
Optimizing RAS Rate



Optimizing RAS Rate



State Point Analysis



State Point Analysis

Questions ?

