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I: 1200gal of water. 150 lb of salt → Initial aggregation.

50gal of brine(salt & water) (1+Sint)lb → Inlet.

30gal Per minute — Out.

Using balances law:

(Accumulation rate of Salt with a system) = (intake rate of Salt into the system) − (output rate of Salt within the system)

Therefore $\frac{dm}{dt} = m_{in} - m_{out}$

$m_{in} = \frac{50gal}{min} \times \frac{(1+Sint)lb}{gal} = \frac{50(1+Sint)lb}{min}$

$m_{out} = \frac{30gal}{1200gal} = 0.025 = 2.5\%$ of m

$\frac{dm}{dt} \times \frac{lb}{min} = \frac{50(1+Sint)lb}{min} - 2.5\%$ of $\frac{m\ lb}{min}$.

$\frac{dm}{dt} = 50(1+Sint) - 0.025m$.

Collecting $-0.025m$ from the equation or Separate the Var

$$\therefore -0.025m + 50(1+\sin t)$$

$$= -0.025\left(\frac{-0.025m + 50(1+\sin t)}{-0.025 \quad -0.025}\right)$$

$$\therefore \frac{dm}{dt} = -0.025\,(m - 2000(1+\sin t))$$

Cross multiply.

$[m \neq 20] \therefore dm = -0.025(m - 2000(1+\sin t))\,dt$

Then divide it by $(m - 2000(1+\sin t))$.

$$\frac{dm}{m - 2000(1+\sin t)} = -0.025\,dt$$

$$\int \frac{dm}{[m - 2000(1+\sin t)]} = \int -0.025\,dt$$

$$\int \frac{dm}{[m - 2000(1+\sin t)]} = -0.025 \int dt$$

$$\ln[m - 2000(1+\sin t)] = -0.025t + c$$

$$m - 2000(1+\sin t) = e^{-0.025t + c}$$

$$m - 2000(1+\sin t) = e^{-0.025t} \cdot e^{c}$$

$$m - 2000(1+\sin t) = e^{-0.025t} \cdot m_0$$

$$m - 2000(1+\sin t) = m_0 e^{-0.025t}$$

$$m = m_0 e^{-0.025t} + 2000(1+\sin t)$$

It was given that $t = 0$ mins & Initially; therefore $m = 150$ at $t = 0$.

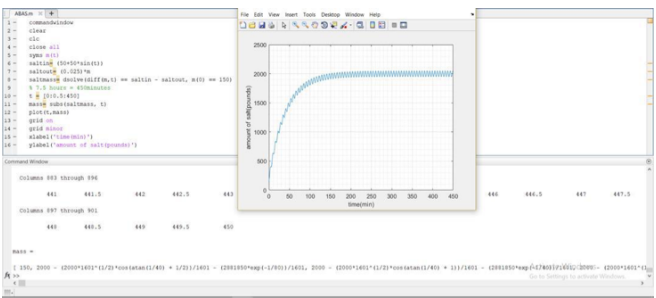
$$150 = m_0 e^{-0.025t} + 2000(1+\sin(0))$$

$$150 = m_0 e^{-0.025(0)} + 2000(1+\sin(0))$$

$$-m_0 = 2000 - 150$$

$$-m_0 = 1850 \quad \text{divide both sides by } (-1)$$

$$m_0 = -1850$$



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