DATE:

Injecting -0.025 from the equation

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

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

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

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

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

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

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

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

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

$M - 2000(1+\sin t) = M_0 e^{-0.025t}$

$M = M_0 e^{-0.025t} + 2000(1+\sin t)$

It was given that $t = 0$ min initially and $M = 150$

$150 = M_0 e^{-0.025t} + 2000(1+\sin t)$

$-M_0 = -150 + 2000$

$-M_0 = 1850$

$M_0 = -1850$ kg

DATE:

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1. 1200 gal of water
155lb of salt → initial aggregation
50gal of brin (salt and water) → Inlet
$(1+\sin t)lb_0$

30gal per minute – Out

using balances law

(Accumulation rate of salt with a system) = (intake rate of salt into system) – (output rate of salt in the system)

Therefore $\frac{dm}{dt} - M_{in} - M_{out}$

$M_{in} = \frac{50}{min} \times \left(1+\frac{\sin t}{5al}\right) lb = 50(1+\sin t)\frac{lb}{min}$

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

$\frac{dm}{dt} \times \frac{lb}{min} = 60(1+\sin t)\frac{lb}{min} - 2.5\%$ of $m\frac{lb}{min}$

$\frac{dm}{dt} - 50(1+\sin t) - 0.025m$