Notes on doing Exercises 4 & 5 in Chapter 10 in Vensim

Chapter 10 describes the Conveyor stock, a special type of stock variable that Stella/Ithink makes available within the stock dialog box. Simply change the stock designation from “reservoir” to “conveyor”, and Stella will assign the slats image and expect you to follow the advice in chapter 10.

These notes describe how you can produce a similar model using the Vensim software. Vensim treats all stocks as regular stocks. Our job is to write the equations for all of the flows that influence the stock. To obtain the tightly controlled flows (like the outflow of students shown in Figure 10.8), one would use Vensim’s DELAY FIXED function to define the outflow. To practice with Vensim, I recommend students skip exercise #3 on page 114. It is more useful to work with exercises #4 and #5. Figure 1 shows the Vensim diagram for the model needed in exercise #4. The stocks are colored in yellow to remind us that these are serving as the Vensim version of a Stella conveyor stock.

![Vensim diagram for exercise #4](image)

**Vensim version of the model in the middle of page 114: exercise #4, Chapter 10**

Figure 1. Vensim version of the model for exercise #4.

The flows in pink make use of Vensim’s DELAY FIXED equations to achieve the tightly controlled flows. For example,

- new eggs hatching = DELAY FIXED(eggs deposited, incubation period, 0)
- maturation = DELAY FIXED(births, maturation period, 0)
- deaths = DELAY FIXED(maturation, adult period, 0)

To get the initial set of 100 eggs to hatch in the 4th month, we need to introduce a separate variable. This equation can make use of Vensim’s PULSE function:

Initial eggs to hatch in 4th month = 100*PULSE(4,1)
In Stella, we use the “MOD” function to keep track of the month of the year. Vensim calls this the MODULO function, so we write the equation

\[ \text{Monthly counter} = \text{MODULO}(\text{time}, 12) \]

Figure 2 is a “print screen” of the model with a Vensim Table in view at the bottom of the screen. This table confirms that the eggs are hatching in the 4th month of each year. The table also shows that the adults appear in the 10th month of each year.

Figure 2. Vensim table to confirm the egg hatching is on the correct schedule.

Figure 3 shows a time graph to confirm the model is working correctly. Since there are no losses in the system, we see 100 adults appearing year after year.

Figure 3. Time graph of the three flows in the Vensim version of the model on page 114.
Student Exercises for Students Using Vensim

Exercise #4 – Verify the Vensim Answer
Use the Vensim’s help feature to read about the DELAY FIXED function and the PULSE function, the new functions used in this model. Then build the model shown in Figure 1. Run the model and produce the table shown in Figure 2 and the graph shown in Figure 3.

Exercise #5: add a 50% egg loss to the Vensim model. Vensim does not apply the losses to the contents of the conveyor, so you will need to apply the 50% loss, as shown in Figure 4 below:

Now, the equation for the new eggs hatching would be new eggs hatching = DELAY FIXED(eggs deposited*(1-egg loss fraction),incubation period,0)

If you run this model with the eggs per female set at 4, you should confirm that 100 adults appear year after year. And they will appear in the 10th model of each year.