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**Course Number: MMA 2025S**

**Course Name: MMA 861: Analytical Decision Making**

**Assignment Name: Assignment 2 Individual**

**Due Date: July 6, 2024 9am**

**Team Name: Team Gordon**

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| **Student Name** | **Student Number** |
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**Question 2**

To minimize costs to approximately $195.89 by proposing to lease out 5 water treatment devices. This analysis was done by optimizing the number of water treatment devices we lease to minimize cost. The decision involves choosing whether to lease 4, 5, 6, or 7 devices. Selecting the appropriate number of devices will help reduce the cost of unprocessed wastewater, which is 10.5 cents per gallon, as well as the leasing cost for each treatment device, which is $33.40.

To minimize cost, we will choose simulation 2, which will be for 5 water treatment devices. This will minimize cost to about $195.89. This was done using @RISK we used 1000 iterations and 4 simulations to find lowest mean total cost. Considering the costs per device, unprocessed water cost and treatment device limitations.

**Technical Analysis**

1. **Decisions:**

* 4 Decisions
  + n (number of devices to lease) = 4,5,6,7
  + number of units leased = risksimtable(integer)

risksimtable(n)  
 **1. Unit occupancy**Riskbinomial(143,0.87)  
 **2. Amount of Waste Water Produced by Unit**RiskNormal(Units Occupied\*22.3,19.2\*SQRT(22.3)) We are scaling the variance and mean over the total amount of units.  
  
**3. Processing Limit**  
risksimtable(n)\*500

**4.** **Excess** **Waste Water Not Treated**  
max(0, Amount of Waste Water Produced by Unit - Processing Limit)  
  
**5. Lease Cost**  
Number of units leased \* 33.40  
  
**6. Pollution Cost**  
Excess Waste Water Not Treated \* 0.105

**KPI Tracking**

**Total Cost** = RiskOutput() +Lease Cost + Pollution Cost

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**Question 4**

We plan to maximize profit by around $37,788.44 by proposing to replace the heating casts after 5 days of use. This will be done by choosing the optimal amount days when the cast should be replaced over a 60-day period.

In our analysis, we will also be looking at the cost to replace the heating cast after 5 days of use (regulation) or if it breaks by itself due to integrity. As well as the cost of the cast if we are not using it during the day.

By using the @RISK add-in on Excel to find the optimal number of days to maximize profit, we can simulate the 5 days. Replacing the cast after 5 days of use gave us the highest profit of $37,788.44.

When looking at the output from @RISK, over the 60 day period we were see that queue exceeding over 10 was at an average of 1.59.

**Technical Analysis:**

1. **Decisions:**

* 4 Decisions
  + d (number of days) = 1,2,3,4,5
  + number of days = risksimtable(integer)

1. **Scheduled Replacement (Binary)** = IF( age of cast > riskinstable({1,2,3,4,5}), 1, 0)
2. **Unscheduled Failure Replacement (Binary)**   
   RiskBinomial(1, vlookup(age of cast, Chance of Failure))
3. **Casts Received/ Beginning Inventory**  
   =IF(RiskPoisson(4.1)
4. **Casts Processed**=IF(Unscheduled Failure Replacement=1,0,5)
5. **Ending Inventory**  
   =MAX(Beginning Inventory - Casts Processed,0)

**KPI we are tacking**

1. **Profit**Revenue = Number of casts completed \* $200.00Waiting Cost = Queue \* $40.00  
   Replacement Cost

Scheduled = Scheduled Replacement \* $800.00

Un-Scheduled = Un-Scheduled Replacement \* $1500.00

Profit = RiskOutput() + Revenue–(Waiting Cost + Replacement Scheduled Cost + Replacement Un-Scheduled Cost)

1. **Queue over 10**

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