Final project

– Minimize the purchase cost of towels for sdfc

**Executive Summary**:

**Base Model:**

***Parameters:***

i = Order size interval ϵ {1,2,3,4}

j = Time plot ϵ {1,2,3,4} ϵ {4-5pm, 5-6pm, 6-7pm, 7-8pm}

t = Month ϵ {1,2,3,4,5,6,7,8,9,10,11,12}

Pt = Number of people coming in per day in month t

PPt = Number of pool parties estimated to hold in month t

W = Number of towels wasted per day, 10

S= Number of towels stolen per day, 5

L= Average number of towels lost in pool party, 50

B = Rate of towels gone bad at end of the month, 1%

NDt = Number of days in month t

LT = Life time of towel, 3 months

NM: Number of washing/drying machines, 2

NTPjk: Number of towels processed per machine in time plot j for month t

TP = The average number of towels per person used, 1.5

T0 = The number of towels hold at the beginning of month 1, 2500

NPjk = Number of towels required by people come into SDFC per day in time plot j for month k

TWjk = Number of towels in washing in time plot j for month t

DTjk = Number of towels become dirty in time plot j for month t

LRi = Lower range for number of towels purchased in order interval i

URi = Upper range for number of towels purchased in order interval i

Ci = Cost per towel purchased in order interval i

SCi = Shipping cost for order interval i

BTt = Number of bad towels in month t (BTt = PPt \* L + W \* NDt + S \* NDt) + TBLt

TBLt = Number of towels beyond lifetime in month t

(TBLt = (TTt-3 – BBt-3) – BBt-2/2 – BBt-1/3 t = 4

= (TTt-3 – BBt-3)/2 - BBt-2/2 – BBt-1/3 t =5

= (TTt-3 – BBt-3)/3 - BBt-2/3 – BBt-1/3 t =6 onwards)

TTt = Total towels in month t, calculated: TTt-1 – TBLt-1 + Xt

***Decisions:***

Xt = The number of new towels purchasedin month t t ϵ {1,2,3,4,5,6,7,8,9,10,11,12}

Yi = Whether total towels purchased for next 12 months falls in order interval i i ϵ {1,2,3,4}

***Objective:***

Min {∑t Xt \* ∑i (Ci \*Yi) + ∑i (SCi \*Yi)}

***Constraints:***

Xt >= 0 ϵ Integer

Yi ϵ {0,1}-Binary.

∑i Yi = 1 (The number of total new towels to be purchased will fall in only one order interval i)

∑t Xt >= LRi \* Yi (For being in an order interval i, the number of total new towels to be purchased must be above the lower range for 12 months)

∑t Xt <= URi \* Yi (For being in an order interval i must be below the upper range for 12 months)

TTt >= ∑i (NPjk – NTPjk\*NW) for all month t (The number of total towels should be more than the demand in month t)