CHAPTER 6

PROPOSED MATERIAL HANDLING SYSTEM AND TRANSITION PLAN

From the information in the previous chapter, we have two proposed systems that can support the capacity of 250 KDGR, the maximum capacity of automation production.

In this chapter, we will present the information of the latest capacity planning quarterly revised for Seagate, Teparuk plant. From the proposed volume build information, to select the most appropriate system for each handling step, we will compare the handling cost per unit of the existing system and each proposed system so we can choose the right option for each handling part. The system transition plan will also be synchronized with the production requirement.

The following information will show that each part of material handling needed to be upgraded by having the production volume as selection criteria. We can prepare for the transition plan by matching these figures to the Production capacity plan. System lead time will also be combined to make sure that we can get the supporting system before required date.

6.1 Proposed Material Handling System for Seagate, Teparuk Plant

Part I: From Raw Material Store to Preparation Area Outside Cleanroom

Material to be transferred: Raw Material in Carton boxes on wooden pallets.

Requirement (250K/day): 1,200 boxes/hr.

Average Distance: 10 meters

Environment constraint: Normal Air-conditioned.

Existing transfer method: Hand Lift truck, 1 set,
Capacity, Raw materials for 226.8 KDGR

Option I Proposed: Redesign transfer pallet, Hand Lift 1 set,
Capacity, Raw materials for 226.8 KDGR

Option II Proposed: Redesign transfer pallet, Hand Lift 1 set,
Capacity, Raw materials for 226.8 KDGR

Handling cost per unit comparison for Part I

Part I	**50 KDGR**	**100 KDGR**	**150 KDGR**	**200 KDGR**	**250 KDGR**
Existing System	$ 0.00045	$ 0.00022	$ 0.00015	$ 0.00011	Max. 226.8
Proposed Option I	$ 0.00052	$ 0.00026	$ 0.00017	$ 0.00013	$ 0.00010
Proposed Option II	$ 0.00052	$ 0.00026	$ 0.00017	$ 0.00013	$ 0.00010

Selection summary for Part I

If the volume build requirement not over 226.8 KDGR use existing system. If not, use new system. (Option I and II are same.)

Part II: From Preparation Area Outside Cleanroom to Cleanroom Load in

Material to be transferred:	Raw Material in Tote boxes.
Requirement (250K/day):	1,200 boxes/hr.
Average Distance:	65 meters
Environment constraint:	Normal Air-conditioned.
Existing transfer method:	Four wheels truck, 7 sets, Capacity, Raw materials for 126.8 KDGR
Option I Proposed:	Four wheels truck 14 sets, Capacity, Raw materials for 253.7 KDGR
Option II Proposed:	Overhead polycord conveyor, 1 line, Capacity, Raw materials for 302.4 KDGR

Part III: From Cleanroom Load in to Material Preparation inside Cleanroom

Material to be transferred:	Raw Material in Tote boxes.
Requirement (250K/day):	1,200 boxes/hr.
Average Distance:	5 meters
Environment constraint:	Cleanroom class 10K.
Existing transfer method:	Polycord conveyor, 2 lines, Capacity, Raw materials for 302.4 KDGR
Option I Proposed:	Use existing method
Option II Proposed:	Use existing method

Handling cost per unit comparison for Part II, III

Part II, III	50 KDGR	100 KDGR	150 KDGR	200 KDGR	250 KDGR
Existing System	$ 0.00233	$ 0.00116	Max. 126.8	Max. 126.8	Max. 126.8
Proposed Option I	$ 0.00369	$ 0.00184	$ 0.00123	$ 0.00092	$ 0.00073
Proposed Option II	$ 0.00408	$ 0.00204	$ 0.00136	$ 0.00102	$ 0.00082

Selection summary for Part II, III

If the volume build requirement not over 126.8 KDGR use existing proposed. If not, use Option I system if 37 sq.m. production building space free up is possible. If volume build requirement over 126.8 KDGR but cannot free up space, use Option II system.

Part IV: From Material Preparation inside Cleanroom to HGSA Production

Material to be transferred: Raw Material in Tote boxes.

Requirement (250K/day): 1,200 boxes/hr.

Average Distance: 70 meters

Environment constraint: Cleanroom class 10K.

Existing transfer method: Free flow conveyor, 2 lines,
Capacity, Raw materials for 302.4 KDGR

Option I Proposed: Use existing method

Option II Proposed: Use existing method

Part V: From HGSA Production to Packing Area inside Cleanroom

Material to be transferred:	Finished Goods in Tote boxes.
Requirement (250K/day):	350 boxes/hr.
Average Distance:	60 meters
Environment constraint:	Cleanroom class 10K.
Existing transfer method:	Free flow conveyor, 2 lines, Capacity, Raw materials for 453.6 KDGR
Option I Proposed:	Use existing method
Option II Proposed:	Use existing method

Part VI: From Packing Area inside Cleanroom to Cleanroom Load out

Material to be transferred:	Finished Goods in Tote boxes.
Requirement (250K/day):	350 boxes/hr.
Average Distance:	25 meters
Environment constraint:	Cleanroom class 10K.
Existing transfer method:	Polycord conveyor, 2 lines, Capacity, Raw materials for 453.6 KDGR
Option I Proposed:	Use existing method
Option II Proposed:	Use existing method

Part VII: From Cleanroom Load out area to Packing Area outside Cleanroom

Material to be transferred: Raw Material in Tote boxes.

Requirement (250K/day): 1,200 boxes/hr.

Average Distance: 90 meters

Environment constraint: Normal Air-conditioned.

Existing transfer method: Four wheels hand truck, 3 sets,
Capacity, Raw materials for 163.3 KDGR

Option I Proposed: Four wheels hand truck, 5 sets,
Capacity, Raw materials for 272.2 KDGR

Option II Proposed: Overhead polycord conveyor, 1 line,
Capacity, Raw materials for 453.6 KDGR

Handling cost per unit comparison for Part VI, VII

Part VI, VII	50 KDGR	100 KDGR	150 KDGR	200 KDGR	250 KDGR
Existing System	$ 0.01032	$ 0.00516	$ 0.00344	Max. 163.3	Max. 163.3
Proposed Option I	$ 0.01375	$ 0.00688	$ 0.00458	$ 0.00344	$ 0.00275
Proposed Option II	$ 0.00775	$ 0.00387	$ 0.00258	$ 0.00194	$ 0.00155

Selection summary for Part VI, VII

Use option II proposed, prepare installation plan of overhead polycord conveyor as soon as possible. But the installation must be completed before that production volume go over 163.3 KDGR.

Part VIII: From Packing Area outside Cleanroom to Finished Goods Store

Material to be transferred:	Finished Goods in Carton boxes on wooden pallets.
Requirement (250K/day):	350 boxes/hr.
Average Distance:	10 meters
Environment constraint:	Normal Air-conditioned.
Existing transfer method:	Hand lift truck, 1 set, Capacity, Raw materials for 453.6 KDGR
Option I Proposed:	Use existing method
Option II Proposed:	Use existing method

From the material handling system selection by having production volume as selection criteria, we will present the information of the latest capacity planning quarterly revised for Seagate, Teparuk plant.

From the proposed volume build information, to select the most appropriate system for each handling step, we will compare the handling cost per unit of the existing system and each proposed system so we can choose the right option for each handling part. The system transition plan will also be synchronized with the production requirement.

Adding system lead time will also be needed to make sure that we can get the supporting system before required date. In next part, we will add this information together and come up with the transition plan of the system needed to be modified.

6.2 Long range capacity plan (3 years plan): 2nd Quarter of the year 2004

HGSA Automation ratio by Volume

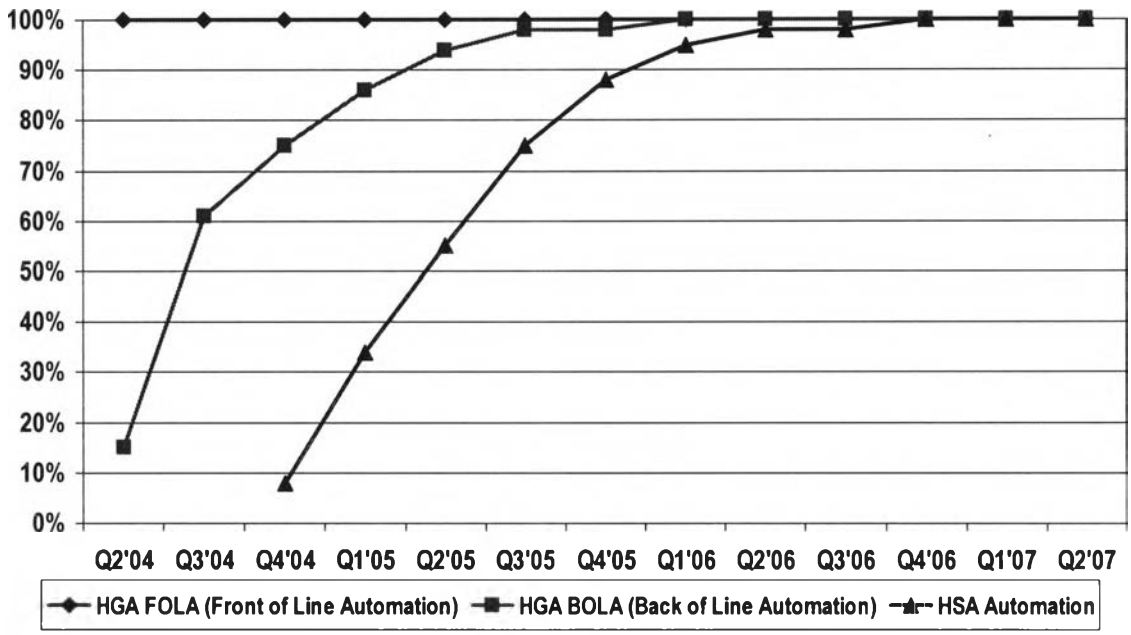

Figure 6-1: HGSA Automation ratio by Volume

HGSA Volume Build 3 years plan (KDGR)

Fiscal Year 2004	Q2'04	Q3'04	Q4'04
MSG (Mobile Storage Group)	21.56	30.19	35.81
PSG (Personel Storage Group)	23.00	32.20	38.20
ESG (Enterprise Storage Group)	27.31	38.24	45.36
Total	***71.88***	***100.63***	***119.38***

Fiscal Year 2005	Q1'05	Q2'05	Q3'05	Q4'05
MSG (Mobile Storage Group)	47.63	51.30	58.73	63.11
PSG (Personel Storage Group)	50.80	62.70	71.78	77.14
ESG (Enterprise Storage Group)	60.33	76.00	87.00	93.50
Total	***158.75***	***190.00***	***217.50***	***233.75***

Fiscal Year 2006	Q1'06	Q2'06	Q3'06	Q4'06
MSG (Mobile Storage Group)	60.94	56.93	49.50	48.00
PSG (Personel Storage Group)	82.88	84.15	86.63	89.33
ESG (Enterprise Storage Group)	99.94	106.43	111.38	111.00
Total	***243.75***	***247.50***	***247.50***	***248.33***

Fiscal Year 2007	Q1'07	Q2'07
MSG (Mobile Storage Group)	48.60	49.97
PSG (Personel Storage Group)	88.87	94.20
ESG (Enterprise Storage Group)	111.40	105.20
Total	***248.87***	***249.37***

6.3 System transition plan based on selection criteria

From the selection summary of the 8 parts of material handling of Seagate Teparuk Plant, there will be 3 steps of material handling system conversion based on the state of nature of the selection criteria.

6.3.1 Before the production volume go over 126.8 KDGR, we need to do changing on that part II and III of material handling system. From the capacity planning, we need to finish the transition before the 1st quarter of year 2005.

6.3.2 Before the production volume go over 163.3 KDGR, we need to do changing on that part VI and VII of material handling system. From the capacity planning, we need to finish the transition before the 2nd quarter of year 2005.

6.3.3 Before the production volume go over 226.8 KDGR, we need to do changing on that part I of material handling system. From the capacity planning, we need to finish the transition before the 4th quarter of year 2005.

From the data above, the system conversion must be completed as before the specific period. The lead time of each new system will be now added in to make the plan practical.

1. For system part II and III, we will change the part II system and link the new system to existing system III. We will select option I, add 7 more four wheel hand trucks, if we can free up 37 sq.m. space at the loading area inside the production building. But since the 37 sq.m. space is not available in the production building, we will select option II, install overhead polycord conveyor linking between preparation area outside cleanroom with cleanroom load in area and link the new system to part III of the system transferring material from cleanrom load in area to material preparation inside cleanroom. The lead time for the new system is 3 months. So we need to start this project before the 4th quarter of the year 2004 in October 2004.

2. For system part VI and VII, we will change the part VII of the system and link the new system to the existing system VI. The option II, install overhead polycord conveyor linking between cleanroom load out area to packing area outside cleanroom is the selected alternative. From the selection summary for this part, this installation can be done as soon as possible but it is needed to be done before the 2nd quarter of the year 2005. The lead time of the system is 3 months and the system location is at the same area as the part II of the handling system, we will do the transition of part II and part VII at the same period. So this project is needed to be started before the 4th quarter of the year 2004 in October 2004.

3. For system part I, we will change it to the new system, modify transfer pallet to be able to carry 72 carton boxes instead of existing capacity of 54 boxes. The lead time for the new system is 1 months. So we need to start this project before September 2005.

6.4 Summary

The selection criteria for material handling system in studied site can be divided into two levels, the first level is the requirement from the product and manufacturing environment which the implemented system needed to have which are:

- Capacity of the transfer system.
- Product delicacy.
- Environment of handling.
- Building construction constraint.
- Safety of the system.

Another level of the selection criteria is the criteria used to compare the systems that can meet the first level criteria. The selection criteria must reflect to the performance and value of the handling system. The criteria that can indicate the profit the handling system are:

- Space occupied
- Utility consumption
- Investment
- Level of Work in process
- System maintenance requirement
- Labor required

For this level, all stated criteria can be transformed into handling cost per volume build which is easier to be compared.

In order to deal with the capacity of 250 KDGR of automation production, the material handling system is needed to be modified. The 8 steps of the existing material handling system, shown in figure 6-1, will be reduced to be 6 steps, shown in figure 6-2.

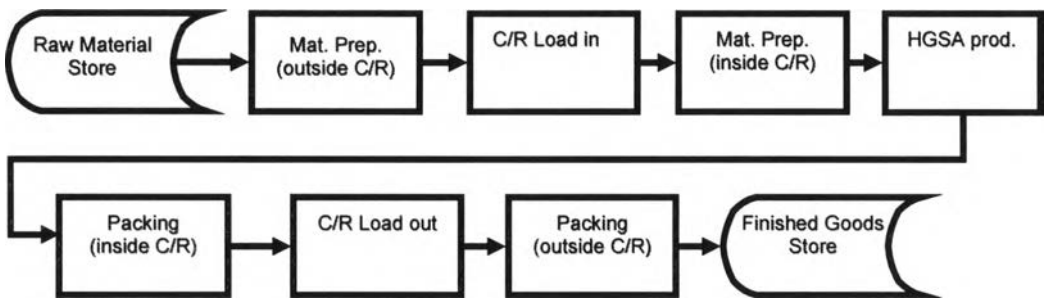

Figure 6-1: Existing HGSA Material Flow

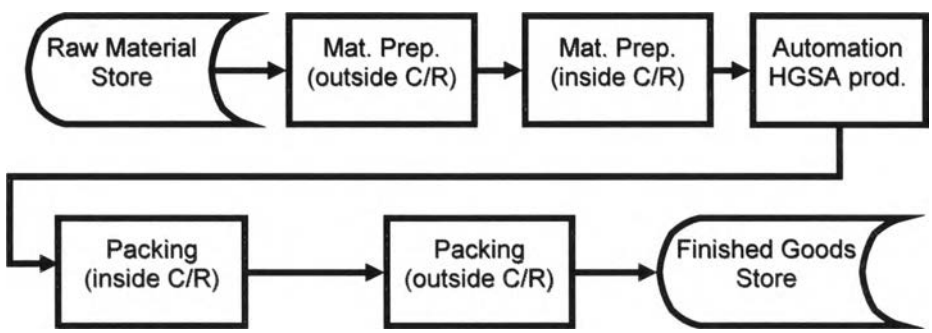

Figure 6-2: Proposed HGSA Material Flow

The combination of part II and part III in the existing material handling system can reduce one step of the handling system. Another reduction is from the combination of part VI and part VII.

The proposed material handling system will be consisted of 6 parts as the following details:

1. From Raw Material Store to Preparation Area outside Cleanroom: We will still use the hand lift truck but the transfer pallet will be new design. The replacement of the existing pallet (1.2 x1.0 m^2) with new pallet (1.2 x1.2 m^2) will be started in September 2005 and completed in October 2005,

2. From Preparation Area outside Cleanroom to Preparation Area inside Cleanroom: We will install overhead polycord conveyor and link it with the existing free flow conveyor at both side of cleanroom load in. The installation will be started in September 2005 and completed in January 2005.

3. From Material Preparation inside Cleanroom to HGSA Production: The existing free flow conveyor will still be used.

4. From HGSA Production to Packing Area inside Cleanroom: The existing free flow conveyor will still be used.

5. From Packing Area inside Cleanroom to Packing Area outside Cleanroom: We will install overhead polycord conveyor and link it with the existing free flow conveyor at both side of cleanroom load out. The installation will be started in September 2005 and completed in January 2005.

6. From Packing Area outside Cleanroom to Finished Goods Store: The existing hand lift truck with pallet will still be used.