Chapter 4

Information System Development

The system development in this study deals with the collection of massive recording head test performance data and processing the data into information that supports real time triggering of warning signals, quick response problem solving, management of engineering changes and the management-based activities. Hence, it involves interviews and discussion with the concerned people in HGA organization to obtain the appropriate model. Those people who understand the situation can provide suggestions and details of processing in making analysis and decision making.

4.1 Recording Head Trend Analysis

The recording head trend indicates the necessity of information systems for HGA performance test to be developed to support HGA organization workload according to the rapid changes significantly of technology and demand as outline below;

1) HGA volume build keeps increasing which follows the rigid disk drive demand. The product design cycle is also reduced due to time to market pressures. Results to low product capability, poor test process and rapid changes of product design. As shown in figure 4.1 and 4.2, the disk drive market trend and technology trend respectively and several changes required during producing products as shown in figure 4.3.
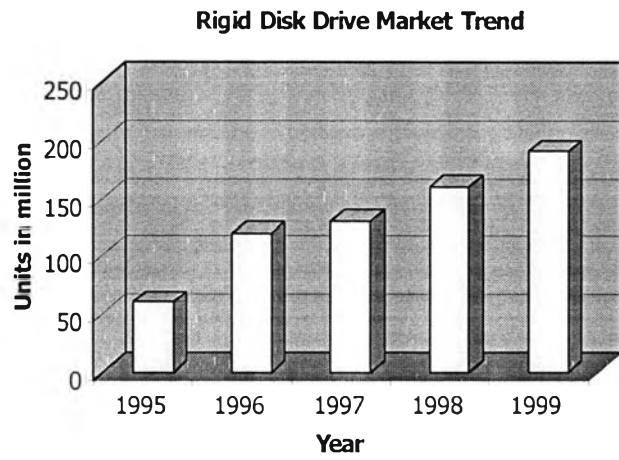
Rigid Disk Drive Market Trend

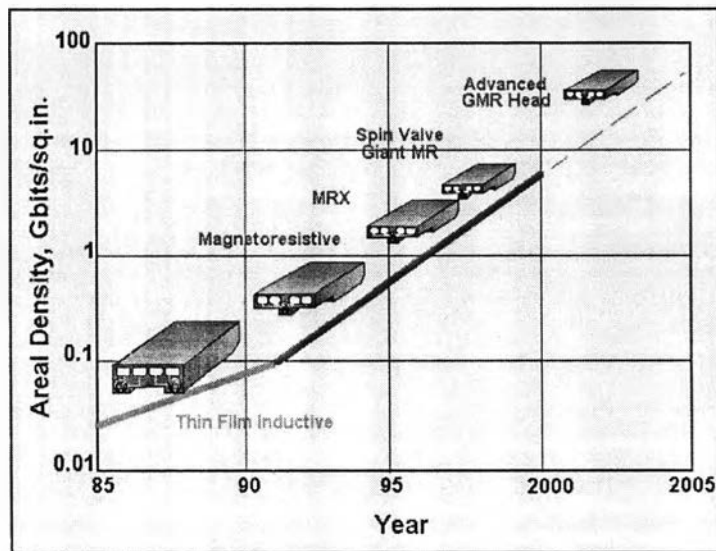Figure 4.1   Rigid disk drive market trend

Figure 10. Magnetic head evolution

Figure 4.2   Technology Trend of HGA

Planned Evaluation List   (Updated on 9-MAR-99)
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Priority	Wafer	HGA PCA#	Drive SBR	Description	QTY	Start Date	TMWI	Status
1	RH	30050	•	Evaluate CVC deposition process on RHODS	2X / group	9-Mar	XCVC	
2	RH	30394	•	Evaluate sliders from crack pole tip quads		8-Mar	XCPT	DONE MAR 9,99
3	RH/MW	TBD	4032	Build .62 / .72 AAB HGA's	4.5K pr HW, 4.5K pr RH	WW37		Has #1 priority as soon as sliders arrive in FW37.
Concurrent	RH	30642	-	Label HGA's with relieved OTC spec for two weeks.				
Concurrent	RH/MW	30637		Update all CH18/9LP script files				
Concurrent	RH/MW	30512	•	Use correct HGA part nums at testers for FOS 5	N/A	need commit		Need commit to use correct HGA part numbers for all FOS 5 HGA's.
Concurrent	RH/MW	29507	-	Collect excl MRE fails for AT1301 correlation	450 pr. RH, 450 pr HW.	8-Feb-99		In process, status from Apchart?
Concurrent	RH/MW	28824	•	Phase 1 implementation of AT1301, S/W, F/W				Inform NRM of testers that changes are implemented on.
Concurrent	RH	28237	-	Surface Finish Audit				PO# 57874 approved on 25-Jan.
Concurrent	RH	30642	•	Label HGA's with relieved OTC spec for two weeks.				
Concurrent	RH/MW	30512	•	Use correct HGA part nums at testers for FOS 5	N/A	need commit		Need commit to use correct HGA part numbers for all FOS 5 HGA's.
Concurrent	RH/MW	30637		Update all CH18/9LP script files				

COMPLETED (or no longer pending):
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Priority	Wafer	HGA PCA#	Drive SBR	Description	QTY	Start Date	TMWI	Status
4	RH	TBD		Minot mask set qual	4000 HGA's min.			Slider SEQ# not issued yet, finished sliders won't be available for ~3 weeks
3	RH	28581	3879	Centerline RSA/PSA SER	~9500 sliders/group	TBD #		Soon to be cancelled per AMK / Teparuk discussions?
1	RH	28698		3M FOS Rev 5 (FOS foot)	5K pr.	FW32		FOS will ship from NRM on Wed, 3-Feb
5	RH/MW	29692		Ipoh Soda Blast Process qual	~20k/grp	FW32		PNG reissuing bars, timeline not available, probably have sliders FW32
4	RH	29059		Evaluate extended etch on N4 / soda	~3300 sliders / group	2-Feb		SEQ# 5926,5927,5928 expected to ship from PNG on 22-Jan
3	RH	28840		Row Slice Lap Dimension qual	100pr/gp	1-Feb		DONE
1	RH	•	3962	Stress SGAW for drive evaluation.	2.64 K Prs/group	JAN 26,99	X62A,X62B	Due to Drive yield drop from 80% to 72%, need to find out root cause urgently
2	RH	•	3963	MR Max del spec evaluation.	1.32 K Prs/group	29-Jan		Expect ship to Wellgrow on 2-Feb
7	RH	29028		Collect repeatability data for Sort3 and Sort4 HGA's				
1	AYX	29012	3950	Wafers processed with DC mag. w/MW-like gaps	7K pair	21-Jan	XSS61	SEQ#SS61, shipped Mon 11-Jan
5	RH	29025	3913	sliver SX&LPCP test	3.84K pr finished HGAs	18-Jan		Expect HGA's to ship to Wellgrow Wed, 20-Jan
6	HW	28716		Build HGA's from 5 AVC wafers processed w/CVC	~ 48K or more total			Flowed through STTH-T uncontrolled
Concurrent	RH/MW	28701		Sample Fly before ET	200 prs	DEC 17,98	X8EF,XAF	
Concurrent	RH/MW	TBD		Limited build Tin/Bismuth too lap mach.	TBD			
Concurrent	RH/MW	27440		Collect excl ISOWR,SUBR,SUBW fails	TBD	DEC 21,98		

Figure 4.3   Evaluation list of Cheetah 18 product

2) Number of tester and assembly lines keep changing according
   to HGA demand as shown in figure 4.4.   More problems time
   consuming of manipulating information and complicate
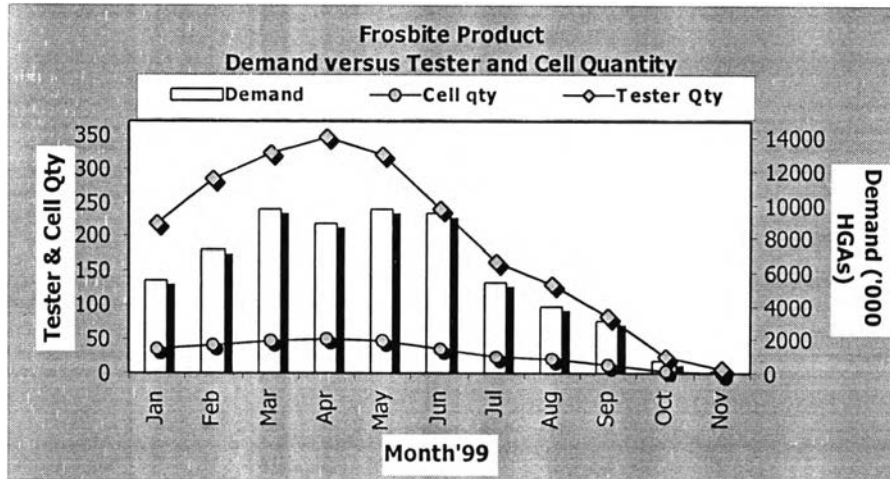   analysis may be affected.

Figure 4.4 HGA demand versus assembly lines
and tester quantity

4.2   User Requirement Analysis

The model developed must be also based on user requirement to
minimize difficulties in working environment within the HGA
organization such as several focuses directed from management,
miss-communication among teams, non-standardize methods that
affects to non-experienced engineers, time constraints etc.

4.2.1 Output Analysis

Output analysis deals with users to design the formal reports
upon to users' requirement and functions. Those formal
reports can be grouped into two information types to support
different purposes, which are analysis type and real time
triggering type for warning problem.

The analysis type provides information routinely to eliminate
activity of crunching data manually as the frequency shown in
figure 4.5. The engineering groups can now focus their time
improving product performance, tester & tester controls and
technical development.

Report Type	Overall Performance	By Wafer	By Cell	By Tester	Internal/External Analysis	Remark
• Evaluation	✓	✓			✓	3 evaluations/week
• Shiftly	✓	✓		✓	✓	
• Daily	✓	✓	✓	✓	✓	
• Weekly	✓	✓		✓		
Average / day (times)						10

Figure 4.5 Frequency of crunching test performance
data manually

The real time triggering type provides on-line information to
support quick response problem solving of front line
technicians. It facilitates their work in providing most
updated and valuable information to monitor testers and react
to problems fast.

As shown in figure 4.6 and 4.7 is the analysis information
report and triggering report that be formulated according to
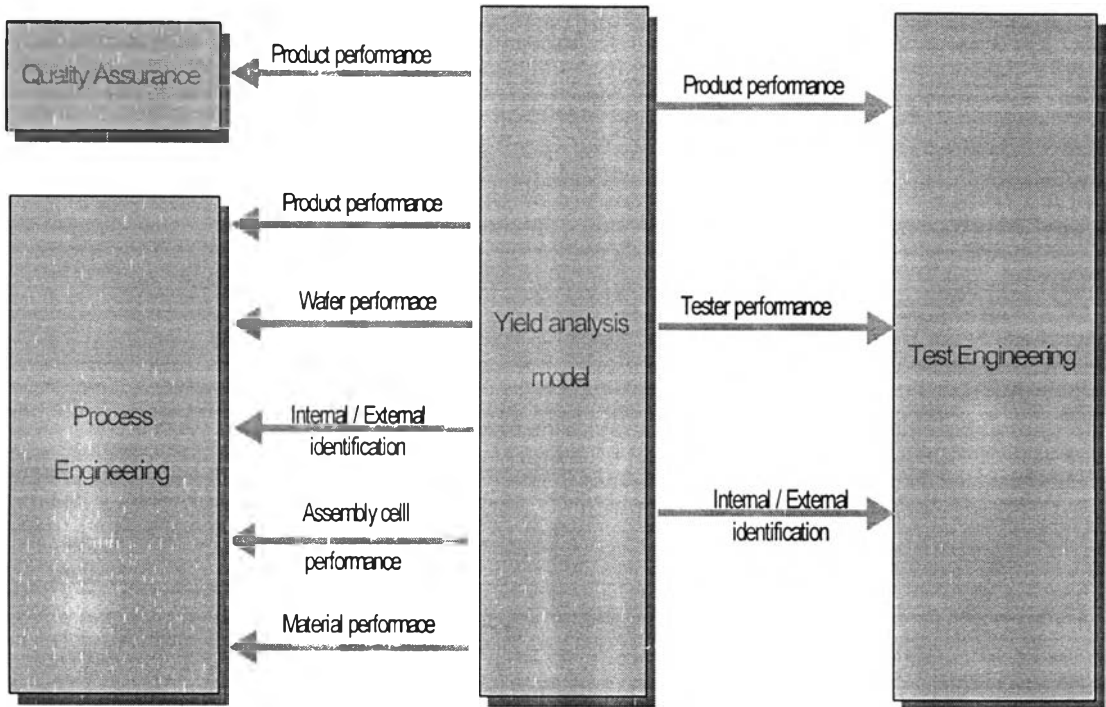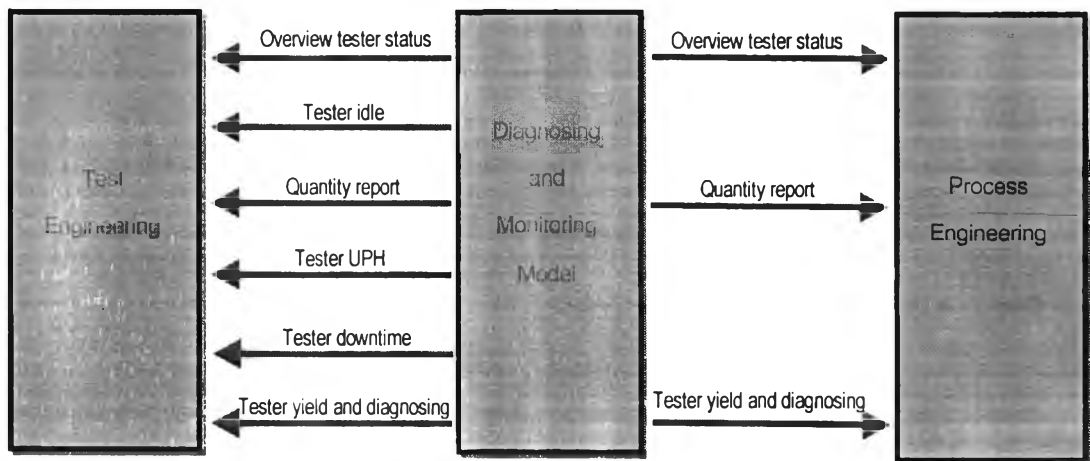user requirement as described above.

Figure 4.6 Analysis model

Figure 4.7 Diagnosing & Monitoring model

4.2.2 Input Analysis

Input analysis deals with information review that users want to collect which are upon on their primary activities and their perspectives. The analysis was reviewed and used to formulate formal reports, as users require. As shown in figure 4.8 is the information that users want to collect and use to support their primary functions.

Available Information	Teams Activities														
	Quality Assurance	Product							Test Engineering						
	Product Performance Monitoring	Product Performance Monitoring	Tester Performance	Wafer Performance	Material Performance	Assembly Cell Performance	Internal / External Analysis	Online system and diagnosing	Product Performance Monitoring	Tester Performance	Wafer Performance	Material Performance	Assembly Cell Performance	Internal / External Analysis	Online system and diagnosing
Yield Analysis Model															
1) Product performance	Y/2	Y/3							Y/3						
2) Tester Yield	N		Y/2							Y/3					
3) Wafer Performance	Y/1			Y/3							Y/1				
4) Material Performance	Y/1				Y/3							Y/1			
5) Assembly Cell Performance	N					Y/2							Y/1		
6) Internal / External Identification	N						Y/3							Y/3	
Diagnosing and Monitoring Model															
1) Overview Tester Status	N							Y/1							Y/2
2) Tester Yield and Diagnosing	N							Y/3							Y/3
3) UPH	N							N							Y/2
4) Quantity	N							Y/2							Y/2
5) Downtime	N							Y/1							Y/3
6) Tester Idle	N							Y/1							Y/2

Y = Require   N = Not Require

Level of requiremnt   0 = No
                             1 = low
                             2 = medium
                             3 = high

Figure 4.8 Input analysis based on users' function
and requirement

4.3 Establishment of Standard Manufacturing Tracking

It is necessary to establish standard manufacturing tracking
to standardize the data flow to the developed models. These
procedures will be communicated through engineering and
manufacturing groups to follow it which not only be used with
the models but also facilitates the engineering group to
interact with its counterparts in oversea or other groups
internally.

"TMWI" is called as the common name of standard manufacturing
tracking that stands for "tracking manufacturing work
instruction". It plays the significant role in identifying
information in database as outlined below.

	Material type	TMWI
1)	Prime sliders	P____
2)	Retest process	RE___
3)	Evaluation sliders	X____

4.4 Output Definition

Output definition is the formal reports formulated after
completion of input and output analysis, which associate with
users. The two models; analysis model and triggering model
are designed and implemented in HGA manufacturing area at the
test operation. User interface is also performed to ensure
the information system work appropriately and support users as
require. As shown in figure 4.9 and 4.10 for the analysis
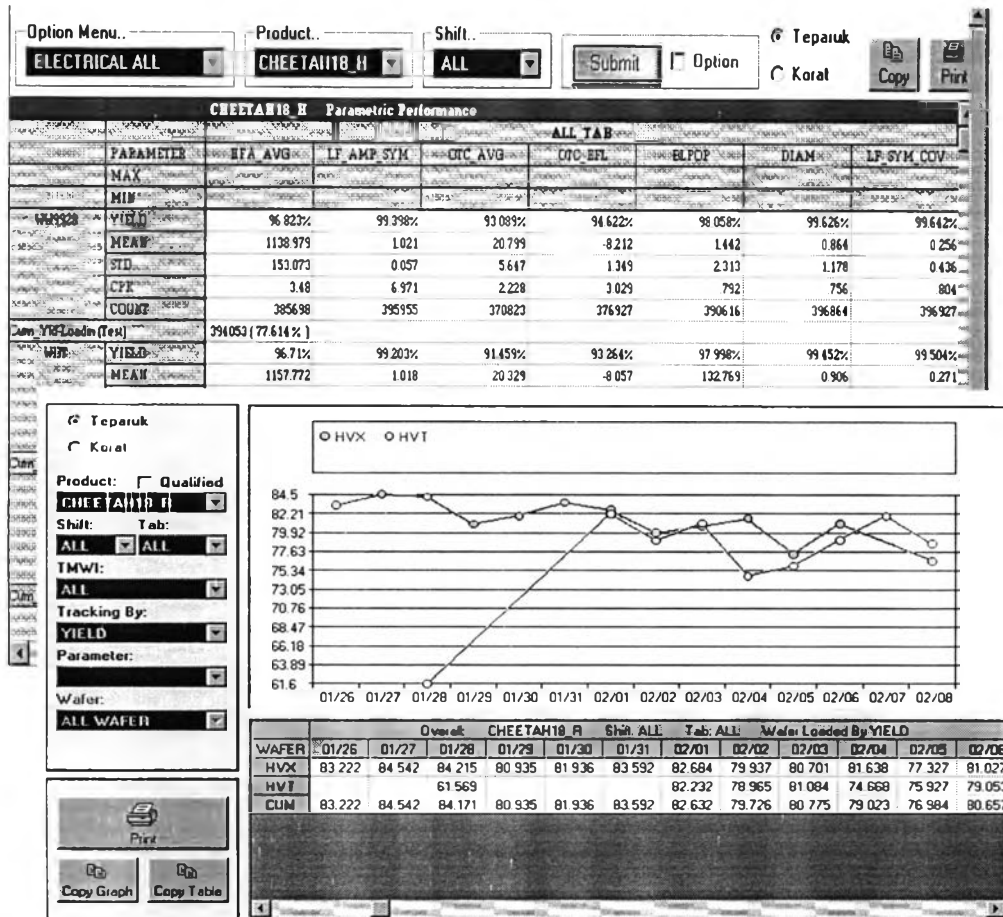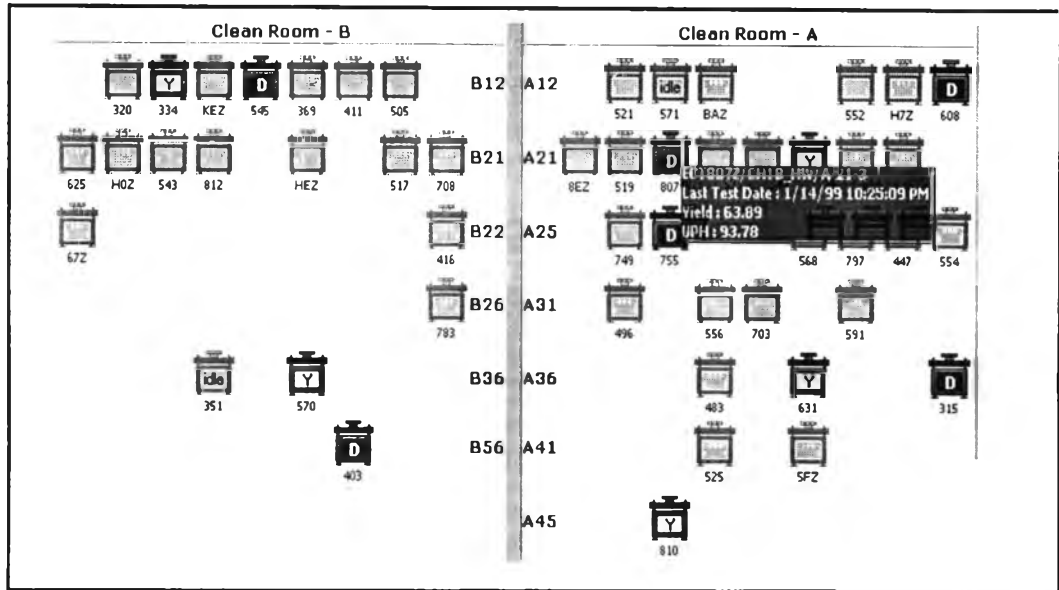model and diagnosis and monitoring model respectively.

CHEETAH18_H Parametric Performance

PARAMETER	HFA_AVG	LF_AMP_SYM	OTC_AVG	OTC_EFL	ELPOP	DIAM	LF_SYM_COV
MAX							
MIN							
YIELD	96.823%	99.398%	93.089%	94.622%	98.058%	99.626%	99.642%
MEAN	1138.979	1.021	20.799	-8.212	1.442	0.864	0.256
STD	153.073	0.057	5.647	1.349	2.313	1.178	0.436
CPK	3.48	6.971	2.228	3.029	.792	.756	.804
COUNT	385698	395955	370823	376927	390616	396864	396927
Cum YR-Loadin (Tex)	394053 (77.614%)						
WIP YIELD	96.71%	99.203%	91.459%	93.264%	97.998%	99.452%	99.504%
MEAN	1157.772	1.018	20.329	-8.057	132.769	0.906	0.271

⦿ Teparuk
○ Korat

Product: ☐ Qualified
CHEETAH18_H ▼
Shift: Tab:
ALL ▼ ALL ▼
TMWI:
ALL ▼
Tracking By:
YIELD ▼
Parameter:
▼
Wafer:
ALL WAFER ▼

Print Copy Graph Copy Table

○ HVX ○ HVT

(chart: y-axis 61.6 to 84.5; x-axis 01/26 01/27 01/28 01/29 01/30 01/31 02/01 02/02 02/03 02/04 02/05 02/06 02/07 02/08)

	Overall	CHEETAH18_R		Shift: ALL		Tab: ALL	Wafer Loaded By YIELD				
WAFER	01/26	01/27	01/28	01/29	01/30	01/31	02/01	02/02	02/03	02/04	02/05	02/06
HVX	83.222	84.542	84.215	80.935	81.936	83.592	82.684	79.937	80.701	81.638	77.327	81.027
HVT			61.569				82.232	78.965	81.084	74.668	75.927	79.053
CUM	83.222	84.542	84.171	80.935	81.936	83.592	82.632	79.726	80.775	79.023	76.984	80.657

Figure 4.9 Examples of analysis model

As shown in figure 4.9, the upper chart (called quick sheet) reports HGA performance of the selected product on a daily and weekly basis. Data of last workweek, which is shown on the top can be used as a comparison. The bottom chart, the wafer analysis sheet, reports yields by wafer code of that product, which at times may perform differently.

Figure 4.10   Examples of diagnosing and monitoring model

As shown in figure 4.10, the top picture is a quick view of testers and their location in the clean room. The status of those testers is also shown. On this page, users can select the product to view. The bottom chart shows yield by testers of the selected product.

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