Chapter 4

Year 2000 Compliance Plan and Its Implementation

From the knowledge that the Year 2000 Crisis is involved the whole corporation not just individual system, however, this research will focus upon only the Production Equipment. This research will involved the only necessary interfaces of the Production Equipment to the rest of the System.

Using the Standard Year 2000 Compliance Project, there are 5 phases involved. These five phases will involve the detail work of planning, execution and check the result for each phase. These five phases are:

- Planning and awareness
- Assessment (inventory)
- Remediation (renovation)
- Validation
- Implementation

This chapter will involve all of the phases mentioned above. However, the last Phase is involve a lot of detail work, which required detail explanation. Therefore, this research has divided the Final Audit and Contingency & Recovery Plan into chapter 5 due to the detail and nature of the work.

Awareness

Planning

In general, there are 5 steps for Year 2000 Compliance, which are :

- Planning and awareness
- Assessment (inventory)
- Remediation (renovation)

- Validation
- Implementation

However, IEEE guideline [14] mentioned that there is no detail validation guideline for the last phase, Implementation. IEEE recommended the organization to put effort to customize and develop solution individually for organization, including plan, audit and manage the Implementation Phase with the goal of detecting, locating and addressing such problems. This is due to potential interdependencies between any remediated/validated system and the operational environment within which it must function, there is a likelihood that additional problems will emerge in the Implementation Phase. The origins of these problems could be in the remediated/validated system, in some other system(s) in the environment, or in the interactions among them.

In order to have better minitoring and control over the implementation phase, CSM has rearrange and develop detail plan of Year 2000 Compliance Phases to a new Implementation plan. In this plan, CSM decided to take out the Remediation and Validation Phases in IEEE. This is because these two phases is working on the solution off-line before implementation in the real production line, which is contradict ng with CSM situatuation. CSM already has the operating production line and the solution is develop by our Vendors. Therefore, these two phases will be done at Vendors' site and transparent to CSM. With this mentality in mind the emphasize would be on Implementation phase. CSM has determined the three activities that required a lot of attention, they are testing, Fixing and Preparing of the Year 2000 Problem. This plan also comprise of five phases as well, they are:

Awareness : Define the year 2000 problem and gain executive level support and sponsorship for establishing the problem as a high priority item for resolution. Research and establish a project plan, and obtain initial resources planning for the rest of the phases. Y2K Service Provider management.

Inventory Assessment : Establish Inventory database of Software and Hardware (include Embedded system). Evaluate the year 2000 impact on the enterprise. Select the Compliance Approach(s), Estimation and Allocation of the Resource needed. Detail Work Plan.

Implementation : Develop Disaster Recovery plans to handle data exchange issues and system failures (dysfunction or system crashes); triage (prioritize) systems by identifying those that are mission critical. Test, certify, and validate individual system before any remediation.

Correction and Recovery : Placing into production converted or replaced one or more system elements. In this phase there are two steps inside this phase, they are:

- *Remediation (renovation):* Convert, replace, eliminate, or work around one or more system elements; Modify interfaces.
- *Validation:* Test, certify, and validate all system elements that have been converted or replaced.

CSM has combined the two phase, Remediation and Validation together into this phase, since these two phases required to perform one after another.

Final Audit : Validation of all systems by place into the real environment with interfacing between systems. Contingency and recovery plan.

The Diagram below are the Summary of the Phase Activities and the flow of the progress. However, keep in mind that these phases are sometime overlap each other. This is because of the effort to reduce the time implement this project. Therefore, if the activity is not require the result of the previous step, it would start as soon as they have the resource available.

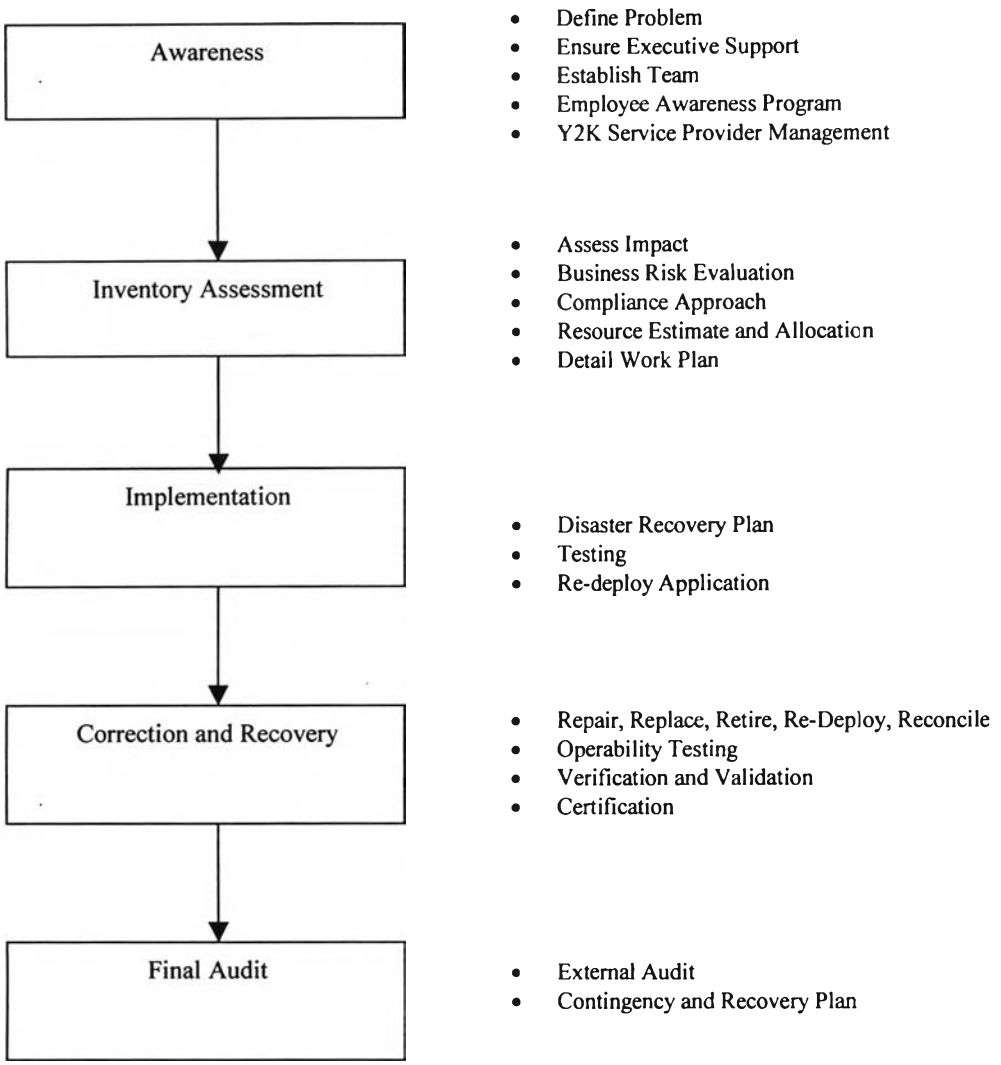


Figure 4.1 : CSM Y2K Phases and Detail Definition

Communication and Commitment

To build awareness of the year 2000 crisis is not mean just telling what is happening and what it can affect the organization as a whole to the Year 2000 team, but it involve the whole organization at all levels and especially the commitment from the top management team.

A crucial step in awareness is creating a communication strategy to ensure that everyone is informed and that management has all of the information they need to make decisions. Top down commitment to support the conversion is essential to the Project.

Creating the Company Policy, Program and Strategy are the basic foundation required to convert subjective supports to objective roadmap. Passing on the policy from management decision to the operation level is another step that required to translate the policy into action items.

All of these activities are completed prior than this research scope. The detail of the work done are in Chapter 3.

Year 2000 Team

The year 2000 team is need to comprise of members from various team according to functional of the organization. In normal case of the Wafer Fab, the organization would be in functional. Therefore, the team will involve Manufacturing Department, Facility, Material/Inventory Planning, Vendor/Engineering Support, IT and Administration. However, this Research will start the stage that Year 2000 Team is already formed.

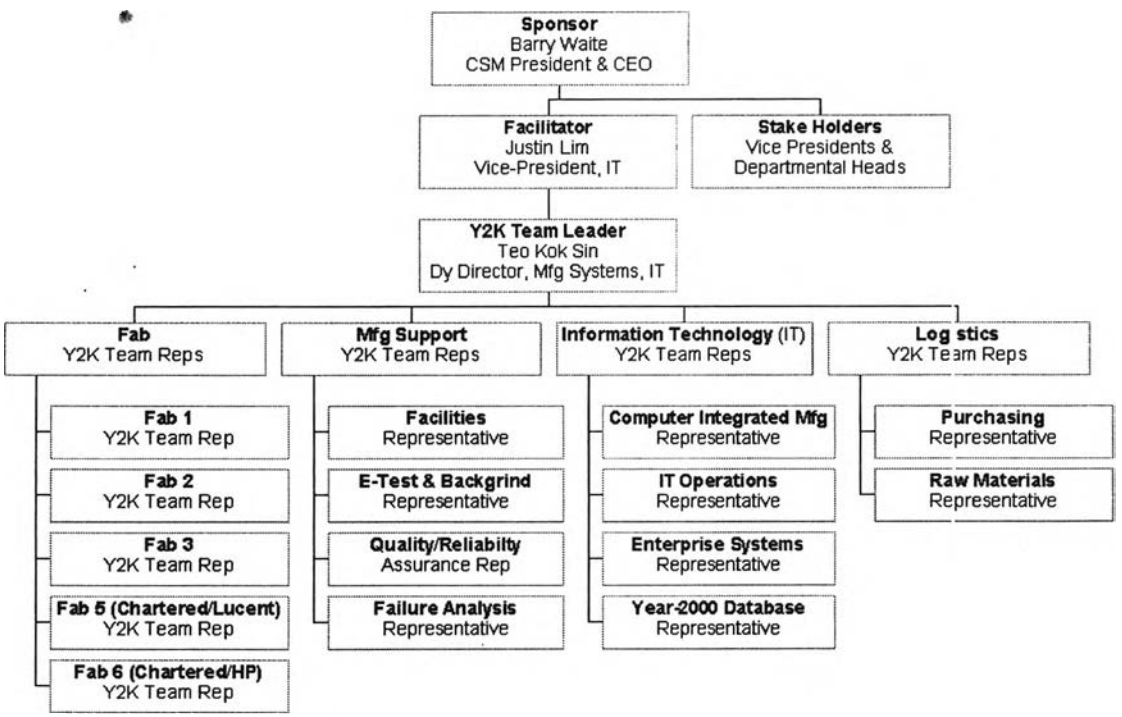


Figure 4.2 : CSM Year 2000 Team Organization Chart

There are committees from each Fab participate and drive the Project to make their Fab Year 2000 Compliant. Each of the Fab committee with contain these groups, if applicable:

1. Clean Tech (Chemical Etch)
2. Diffusion
3. Plasma Etch
4. Ion Implantation (Author is in this Group)
5. Photo Lithography
6. Thin Film
7. Yield Enhancement
8. E-Test (Electrical Test)
9. IT (Production Related, e.g. PROMIS, CIM, etc.)
10. Facility
11. Manufacturing
12. CMP (Chemical Mechanical Polishing)

The year 2000 Team from each Fab will comprise at least one from each module to represent their module cooperation. This team member will act as a coordinator, facilitator, and executor for their area.

Millennium Compliance Definition

There are many Definition from many institutes around the world. There are some differences between the definitions. These differences are involve the way, day and how they Interpret the meaning of the Year 2000 Compliance. There are two famous institutes that publish their definitions as standard, they are BSI DISC (British Standard Institute) and IEEE (International Electrical and Electronics Engineering). However, in the Semiconductor Industry, which majority companies and Research Institute are flourishing in America more than the British side. Therefore, majority of the companies in the Semiconductor Industry adopted the IEEE Year 2000 Compliance definition. CSM is also one of them to adopted IEEE definition to ensure the compatibility with the rest of the Industry.

This definition will determine the budget, time, resource the Compliance program directly. Therefore, selecting the right definition for their industry is necessary for planning for the whole project. It does not include just the planning within the organization, but it will include the external compatibility for the whole supply chain. This would reduce the business interruption as well.

British Standards Institution

DISC PD2000-1 Definition of Y2K Conformity Requirements 4 Rules :

1. No value of current date will cause any interruption in operation.
2. Date-based functionality must behave consistently for dates prior to, during and after year 2000.
3. In all interfaces and data storage, the century in any date must be specified either explicitly or by unambiguous algorithms or inference rules.
4. Year 2000 must be recognized as a leap year.

Scope covers

- IT Systems
- Non-IT Systems / Embedded Systems

Figure 4.3 : Example of British Year 2000 Definition [10]

Another famous definition is from IEEE.[13]

Year 2000 compliant : Year 2000 compliant technology shall correctly process date data within and between the 20th and 21st centuries, provided that:

a) The technology is used in accordance with its associated documentation, and

b) All other technology used with it properly exchanges date data with it.

(This definition requires date data to be processed consistently, predictably, and accurately within the valid date interval(s) This includes date data for the years 1999 and 2000)

where :

technology: Hardware, software, and firmware systems and system elements including, but not limited to, information technology, embedded systems, or any other electro-mechanical or processor-based systems.

date exchange: The interchange of date data between two or more systems or system elements. In order to facilitate proper date data exchange between two or more systems or system elements, defined formats should be identified and documented by the suppliers of systems or system elements.

date processing: The processing of date data within a system or system element, which may include receiving, manipulating, and providing date data.

system element : where used in this standard, refers to any individual component of a computer or microprocessor-based system that participates systematically in a specific process. System elements may include hardware components, firmware routines, operating systems, middleware components, application programs, system utilities and subroutines, scripts, and the like.

Valid date interval (also known as compliance date range)
This is the period of time, expressed by a range of dates, over which the system will provide correct date data processing. The system elements or other factors may limit this interval or may introduce multiple intervals. For example, on a system capable of operation between 1970 and 2038, applications may be capable of correctly processing date data over a much wider range of dates such as 1970 through the year 2069.

There are other definition for Year 2000 Compliance by other institutes, however, for IC Manufacturing industry, which is under Semiconductor Industry based in USA is following the definition of Year 2000 Compliance from IEEE. However, this definition is

not indicate exact time windows. The detail time windows are set by the individual industry. In Semiconductor Industry case, it follows SEMATECH Test Scenarios to certify as Year 2000 Compliant. CSM also following the SEMATECH Year 2000 approach, which base upon the definition from the IEEE.

By using the standard definition, the compatibility of the internal and external systems are ensured. This would also reduce the solution development cost that would incur if the organization want the customize solution.

In some case, the organization may need to develop customized solution by various reasons. One of the most common is due to the limited resources, for instance, time, budget, manpower, vendor solutions. In this case, the Year 2000 Team need to assess what criteria are the most critical to the Business. Then make the organization or partial system compliance to that criteria. In CSM, they called Y2K Ready. CSM has develop their customized solution base on the SEMATECH Test Scenarios

High Risk Dates

In the process of building the awareness to the operation level, the Y2K team need to be educate for the date that is potentially risk the operation. The Team member have to study what date is applicable to their Hardware or Software System

By indicating the date that is a potential risk to the business, the organization will be able to indicate the scope of the project and the resource that they need to use. For instance, if a factory plan to obsolete all of their machines in year 2010, therefore, this factory would not require to fix the problematic date beyond 2010.

The other reason that CSM Fab 1 is choose to follow Sematech Approach is because of the relevant operation date to the application in Semiconductor Industry do not contains the problematic date for other industry. These specific Industry problematic date are needed to analyze to meet the actual Industry time calculation. From the initial analysis, CSM Fab1 has eliminated:

1. GPS system problematic Date – This system is not part of the Semiconductor Industry, therefore, the Date involve with the GPS or

navigation system is not necessary to test in Semiconductor Industry. Fab1 has verify by check with the inventory list and do not found any of the GPS system therefore, the assumption is correct.

2. Julian Calendar – Semiconductor Industry is not utilizing the Julian Date Reference. This is because Julian date are normally use in the military application. Semiconductor Industry is not utilizing customized date but standard date reference. This can be check through the date input, display and storage of the system or check with the equipment suppliers. After analyze Fab1 inventory list, there is no system that develop by military or utilize Julian Calendar.

3. Time Window earlier than 1999 and beyond 2005 – Fab1 do not have the plan to operate beyond 2005. The dates that already passed is not necessary to test anymore, since the damage was done already. The objective is to prevent vent in the future.

4. Date involve with Business Day, Holiday, Weekend, special day – The nature of the Manufacturing industry would operate 24 hours a day, 7 days a week, therefore, the Business day or Holiday would not effect the production equipment. This would affect the business operation more severe than the Manufacturing operation. The check can be done by check the software operation or check with equipment suppliers whether the software is utilizing the business day, weekend or special holiday in their operation. All of the production equipment in Fab1 is not recognize the holiday, weekend, business day or special day.

Therefore, CSM has come out with the list of dates that coincide with the Sematech Recommendation, which included only these date:

Event Horizons	Cause & Potential Impacts
1st January 1999	End Of File magic number terminates SAP R/2 4.4
9th September 1999	9/9/99 Magic Number for EOF sentinel
31st December 1999	Another possible Magic Date for EOF sentinel
1st January 2000	Y2K impacting most date sensitive operations
29th February 2000	Leap year; causing various errors
10th October 2000	first eight positions date representation
1st January 2001	Microsoft Word 95 DATE fail & Magic Date 1/1/1

Table 4.1 : Sematech Potential Problematic Date

These date are selected by the key Semiconductor Manufacturers in Sematech committee and CSM also follow this approach as well. However, in the detail level, for each of the operation module, there would be some adjustment to suit the module, which will be discuss in detail in each of the steps afterward. All of the following Time Window will refer to only these date.

Initial Resource Allocation

An initial estimate of the resource required which includes potential cost elements such as co-ordination, upgrades, etc. There is an ongoing need to ensure that the whole organization and business partners are kept informed. Therefore, assigning the responsibility to the year 2000 team is vital to assess the initial awareness and contribute to communicate down the order chain.

In CSM case, the Year 2000 Team getting the initial resources they required in term of Management Commitment, Time, and Manpower allocated to maneuver this Project Directly.

By setting up the responsible member and regular update meeting, this will ensure the communication is sufficient and progress tracking is easier. The time frame to update is up to the individual department to see as required. Approximately for each update meeting should contain about 30 minutes to 1 hour in order to keep the member

active for all of the update section. However, for the initial meeting and other important progress update meetings are allowed to take much longer time than that.

Managing Y2K Service Providers

Y2K Service Providers are one of the key success of the Project. This is due to fact that most of the solution are required from external. Only minimal applications are capable of develop and fix internally. Progress tracking and control over the Y2K Service Provider, hence crucial to the internal Year 2000 Progress.

There are several practices that CSM use in order to manage the vendor effectively, these practices are:

1. Get the Vendor involve in the early stage. Y2K Service Providers should be inform and involve in the very early stage of the Project. By doing so, the parties that participate will gain their responsibility and build awareness at the same time to their subordinates, customers and suppliers. Although the process of interfacing with external would be necessary only at nearly the end of the Project, however, by allowing external interface system to play the part in setting up the year 2000 compliance program will ensure the compatibility of the interface and time commitment of all the supply chain. Interchanging of the Year 2000 Information along the supply chain will ensure the standardization of the compliance program.

2. Do a high-level inventory. Let the service provider perform the detailed analysis. With the rough list of the Equipment model on hand, the Y2K Service Provider can do analysis and find out the compliant status, support plan, upgrade cost, or obsolescence roadmap they have for that certain model. This Process might take long period at the Service Provider Side, up to a year or two easily, hence they should be inform before 1998 and work concurrently with the organization 's Project.

3. Ask the service provider to set-up an "assembly-line" conversion process through which the company can test run all applications before implement on the production system. This will guarantee the success rate of the upgrade kit and reduce the installation and setup time. The cost of testing the system on the Customer's Site is

much higher than at the Supplier's Site. This is due to the Machine Production time. As we know that the cost of each machine is vary from few millions USD to more than five millions USD. Therefore the earning of the company is heavily rely upon the utilization rate of the capital. By test run at the customer's site, the time taken might incur the cost more than the price added to test at the supplier's site. On top of the Cost, the quality of the Product might affected as well, which would lead to a lot of loss.

4. Turn most of the code modification over to contract programmers. Hire only staff provides with significant experience in large project management. Y2K conversion experience is also desirable, but not necessary. But subcontract all the code modification will reduce the project complexity. Concentrate on the core project objective will provide better utilization over the internal resources.

5. Build a service level agreement with priorities so applications requiring conversion before 2000 will be converted in time. By prioritizing the Service that critical to the Business to Y2K Service Provider, the risk can be reduced.

6. Resist the temptation to do more than convert applications to be 2000-compliant. New technology projects should be approached as such, not as add-ons to a 2000 conversion. Each additional small tasks will lengthen and jeopardize the project's time commitment. An easy calculation of the risk accumulated along the project timeline: assume if there are 3 tasks on the project critical path each has 95% probability to finish within time, the probability that it will finish within time will be

   0.95 * 0.95 * 0.95 = 0.857

   If the additional task decrease the probability to finish within time by 5% to 90%. The probability to finish within time will be

   0.9 * 0.9 * 0.9 = 0.729

   The probability to completed all 3 tasks within time is reduced by 12.8%. Therefore, the more complication it gets, the more risk involve.

From all of the Information on hand, the Y2K Team can establish the initial Plan. The Chart Below is the Year 2000 Master Plan.

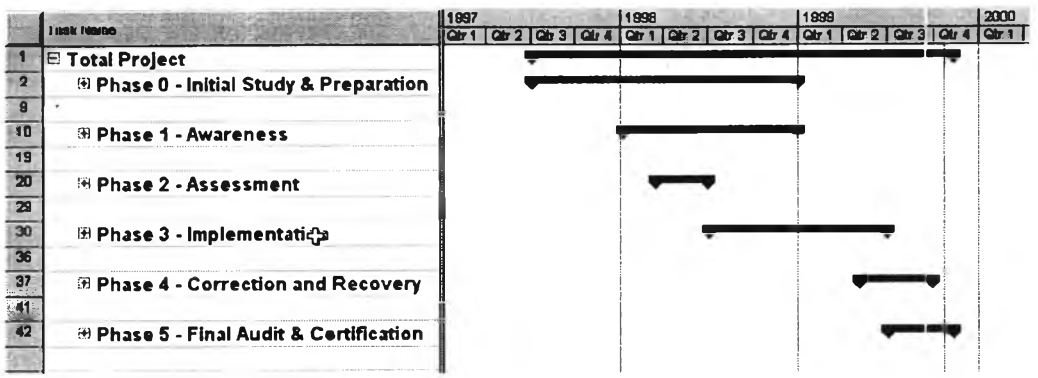
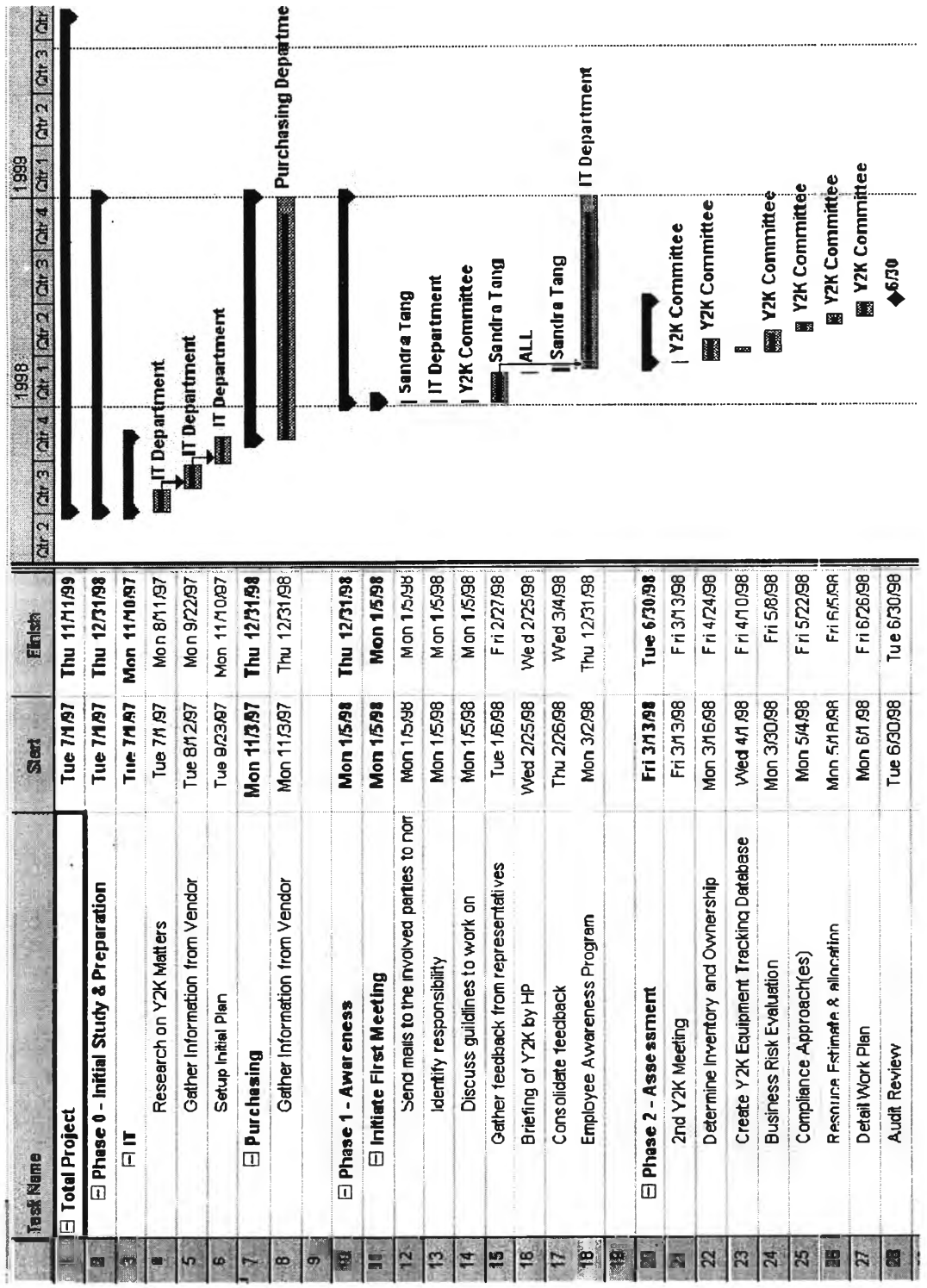


Figure 4.4 : CSM Y2K Timeline



	Task Name	Start	Finish
1	Total Project	Tue 7/1/97	Thu 11/11/99
2	Phase 0 - Initial Study & Preparation	Tue 7/1/97	Thu 12/31/98
3	IT	Tue 7/1/97	Mon 11/10/97
4	Research on Y2K Matters	Tue 7/1/97	Mon 8/11/97
5	Gather Information from Vendor	Tue 8/12/97	Mon 9/22/97
6	Setup Initial Plan	Tue 9/23/97	Mon 11/10/97
7	Purchasing	Mon 11/3/97	Thu 12/31/98
8	Gather Information from Vendor	Mon 11/3/97	Thu 12/31/98
9			
10	Phase 1 - Awareness	Mon 1/5/98	Thu 12/31/98
11	Initiate First Meeting	Mon 1/5/98	Mon 1/5/98
12	Send mails to the involved parties to norr	Mon 1/5/98	Mon 1/5/98
13	Identify responsibility	Mon 1/5/98	Mon 1/5/98
14	Discuss guildlines to work on	Mon 1/5/98	Mon 1/5/98
15	Gather feedback from representatives	Tue 1/6/98	Fri 2/27/98
16	Briefing of Y2K by HP	Wed 2/25/98	Wed 2/25/98
17	Consolidate feedback	Thu 2/26/98	Wed 3/4/98
18	Employee Awareness Program	Mon 3/2/98	Thu 12/31/98
19			
20	Phase 2 - Assessment	Fri 3/13/98	Tue 6/30/98
21	2nd Y2K Meeting	Fri 3/13/98	Fri 3/13/98
22	Determine Inventory and Ownership	Mon 3/16/98	Fri 4/24/98
23	Create Y2K Equipment Tracking Database	Wed 4/1/98	Fri 4/10/98
24	Business Risk Evaluation	Mon 3/30/98	Fri 5/8/98
25	Compliance Approach(es)	Mon 5/4/98	Fri 5/22/98
26	Resource Estimate & allocation	Mon 5/18/98	Fri 6/5/98
27	Detail Work Plan	Mon 6/1/98	Fri 6/26/98
28	Audit Review	Tue 6/30/98	Tue 6/30/98

Figure 4.5 : Initial Year 2000 Timeline for First two phases

Source : Chartered Semiconductor Mfg Internal Year 2000 awareness Program.

Inventory Assessment

Assess impact (Inventory Database)

By compiling all of the equipment from each department in the Production area, this would give the list of Equipment. However, before starting to get the list anew, try to search for the existing document database to start with. In most of the company there should be a list of the capital, this is one of the best place to start with. However, in most of the IC Manufacturing Industry are using the Equipment status tracking system, which is include most of the Production equipment in the Fab. As the general guideline, the list should cover :

1. Hardware
2. Software
3. Relationships (Interaction/Interfaces)

Hardware

Starting with the existing list in the Production Equipment Status Tracking (PROMIS), CSM Fab 1 has 840 equipment. After classified by the department, the summary list of the equipment are:

Department	Equipment
Backlab	14
Diffusion	138
Etch	144
Etest	16
Facility	159
Thin Film	81
General	18
HP E-Test	1
HP Fab	47
HP QA Out	1
HP Transit	1
Implant	14

Incoming QA	3
Mask	83
Out QA	3
QA Final Test	1
Receiving	2
Screen	1
Stat Assy	1
Stat Final Test	1
Transit	2
Tester	107
YE	2
Total	840

Table 4.2 : Summary of Fab 1 Equipment

Software

For this case, since all of the Production Equipment having proprietary software that develop by the equipment provider, therefore they are handle by Equipment supplier. However, the tracking the software still exist by using the same list as the Hardware. Therefore, the progress of the Year 2000 project will count by equipment. This difference of IC manufacturing industry from the general practice is due to the fact that the software are provide by the equipment provider. Most of the time there are no modification done with the equipment software due to compatibility and warranty issue. Since the compliant solutions are also develop by the Y2K service provider as well, this will eliminate the tracking database of hardware or software. CSM will count only the equipment are compliant or not. And if not, what part is not compliant.

Relationships

There are only few system that link between systems in the operation area, the rest of the relationships module are in the financial, and office automation. They are:

1. Wafer tracking system (PROMIS)
2. Computer Integrated System (CIM)

Note : for other fab that has automated material handling systems (AMHS), need to combine this Module into consideration.

After analyze the equipment on hand, CSM has create the checklist to perform the check for all of the system in order to categorize into manageable group.

CHARTERED SEMICONDUCTOR MANUFACTURING LTD

[ ] FAB 1 [ ] FAB 2 [ ] FAB 3 [ ] SMP [ ] CSP

System Description

System: _____ Application: _____

Model No: _____ Software Version No: _____ (if applicable)

Manufactuer: _____ Vendor: _____

Compliance Checklist

1. System utilizes Realtime Clock?	[ ] Yes	[ ] No	
2. System contains software application?	[ ] Yes	[ ] No	
3. System runs on Operation system?	[ ] Yes	[ ] No	
4. System uses date/time application?	[ ] Yes	[ ] No	
5. Vendor reply on Y2K compliance?	[ ] Yes	[ ] No	[ ] N.A.

* If reply is non-compliance, fill up non-compliance portion.

Non-Compliance Checklist

6. Impact on System?	[ ] Yes	[ ] No
7. Solution availabel?	[ ] Yes	[ ] No
a. if solution available, any cost involves	[ ] Yes	[ ] No
b. estimation of cost involves: _____		

End user Information

Name: _____

Date: _____

MILLENIUM CHECKLIST

Figure 4.6 : Initial Y2K Checklist (Source : CSM Internal Y2K Document)

From this list, CSM can categorize the equipment into Compliant and Non-compliant base upon Vendor feedback. The additional information that needs to gather from the vendors in the case of non-compliant is the impact of the date to system and the time for solution availability. These 2 pieces of information is important for the following phases. This is due to the compliant approach consideration and upgrade planning. With the new information, Y2K Team can constructed a new equipment database, this is the new equipment list that taken out the HP Fab equipment (Equipment belong to Hewlett-Packard), Facility (Facility department handle their own equipment) and Wafer Tracking System (Handle by IT). From the feedback, Y2K team can tabulate the data as below.

Vendor's reply, Y2K ?	**Eqpt Qty**	**%**
No (Not compliant)	124	32.7%
Yes (Y2K compliant)	46	12.1%
Pending	17	4.5%
NA	192	50.7%
Total	**379**	**100.0%**

Table 4.3 : Fab1 Equipment Y2K Status in Percentage

At this stage, Implant Module (Author is the representative of this module) has requested the information about the Y2K compliance status from the vendor. In CSM Fab1, vendor for production equipment are consist of:

1. Eaton

Medium Current Implanter

NV6200 2 Units

NV6200-AV 2 Units

High Current Implanter

NV10-80 3 Units

NV10-160 1 Unit

2. Aneric

TP-320	1 Unit

3. KLA-Tencor

Probematric Omnimap 50e	1 Unit

4. Rapid Thermal Annealing

Heatpulse	1 Unit

Vendor Reply

From the inventory of the equipment, each of the operation module can be track the status and progress accordingly. The support from the vendor at this stage is crucial, since there is no physical test done on the system. After check with vendor for the equipment operability and concerns the time calculation. Vendors has reply Implant Fab1 module as followed:

1. Eaton – None of the equipment is Y2K Compliance.

Medium Current Implanter	
NV6200	2 Units
High Current Implanter	
NV10-80	3 Units
NV10-160	1 Unit
Total	6 Units

These 6 units having only one module that contain the time calculation and Record the time into the machine history and parameters log. This unit is Fluke Controller, which is common among the equipment listed above. These six machines are the older generation of Machine, which is not utilizing the standard as a controller. This equipment generation are mostly control by electronics system.

Medium Current Implanter	
NV6200-AV	2 Units

These two units are the newer generation equipment, which utilizing the Standard PC to monitor and Control the system. In these two system the PC is 386 and 486 respectively, which are not Y2K compliance. The operating

system and Application in these two units are identical and is not Y2K compliance as well.

2. Aneric – Pending for Investigation. At the field Service level say that it is Y2K Compliance, however, the Company do not have the official confirmation.

3. KLA-Tencor – Not Y2K Compliance. The computer that run this equipment is base on non-standard 286 PC. This computer contains some proprietary storage cartridge. The reply from the manufacturer is not compliance in PC itself and the application. The impact would be the time stamp on the measurement report and storage.

4. Rapid Thermal Annealing – Not Applicable due to no time calculation, storage, input, and display in the system.

Business Risk Analysis (Impact Analysis)

There are three major areas that is potential hazards to business, they are:

1. Finance
2. Operations
3. Legal Liabilities

Since the Finance and Legal Liability will not have affect directly to the operation, this study will not discuss about them. In Operation area, there are many potential hazards that can happen during testing in IC Manufacturing Industry. And the Hazards are discussed general hazards that applied to all area in the Fab in this industry in Chapter 3, which are History Log, Facilities Failure, Safety, Production Recipe, and Shipment. Therefore, this chapter will focus more on the hazard at the Fab level. The most common risk are:

- Shelf Life of the Photo-resist. Photo-resist has its lifetime, and it cannot be use afterward due to the quality problem. If the shelf life of the Photo-resist is not accurate, it may accidentally use during the process. This problem may not be

able to detect inline. The lost would incur at the end of the process. The Shipment will be affected as well.

- Production Equipment Time Related. All of the production equipment are utilizing the internal clock on the system. Some of the clock is synchronize, some are asynchronize with each other. However, the parameters that can affect are :
    - Etch Time.
    - CMP time
    - Implant Time
    - Drive-in Time, Thermal Budget
    - Chemical Deposition Time
    - Chemical Etch Time
    - Photo-resist Coating Time
    - Develop Time

- CIM and AMHS time Interface mismatch. This could cause the failure in the wafer handling system. This failure might cause the wafer breakage and eventually cause the contamination to other production wafers. This can be a major problem. Keep in mind that a wire in the circuit is smaller than 1/1000 of human hair, the small piece of particle that cannot be observe by naked eye can block the formation of the wire. There are other kind of the contamination as well that can cause defects, that is metallic contamination.

- Mechanical Hazard. If the mechanical movement utilize the internal clock, the error of the clock may cause the mechanical movement behave in different manner.

- Wafer Tracking System (PROMIS). If the time is different than actual, the system might interpret that the WIP is less or more than it should be at a certain time. This would lead to the miscalculation of the Production Planning and WIP in each area.

Determining the Potential Risk (Impact) will be use to determine the scope and the resource required for the rest of the phases as well. When the Year 2000 Team designing the test programs and the contingency plans, these hazards are required to take into the consideration.

From these most common risks, Y2K team needs to analyze the root cause of these risks. Base on the general guideline of the There are four area that Date are possibly containing and process, they are in:

1. Storage
2. Input
3. Display
4. Calculations

With this four area, all of the equipment can be analyze to determine the area that has high impact to the Operation Module. Most common hazards are the basic requirement to look into individual system to ensure the problem does not exist in any of the four areas.

It is necessary to verify these four areas again for each of the equipment. In most cases, the equipment in Fab 1 is quite old and potentially is not Y2K Compliant. By assess the impact on the system, Y2K team can make the decision whether it is necessary to upgrade the system or find another alternative solution available.

By doing so, all of the equipment can be categorize into 4 categories, they are:

1. Compliant but need to test out. This information is come from the vendor, however, the system need to randomly validate in order to ensure the Compliant Standard is meet. In some case, vendor and CSM do not use the same standard or different version. This could make the compliant in doubt.

2. Non-Compliant but has low impact on System. Some of the equipment is not Y2K compliant, but the impact is appearing on the non-critical parameters. This would make the upgrade invulnerable. The analysis based on the knowledge that only

four places that might contains error, input, display, storage and calculation. From this analysis the Y2K committee discussed the impact of each of the category and come up with the general guideline that Y2K Committee agreed for the criteria of the low impact system is

- Impact Display System Only. Some system having the Date and time display in the computer monitor but this date and time is not involve in any date and time calculation in the equipment operation.

- Impact Input Data Only. Some Equipment needs to enter the time and date for the system to keep in the machine log. Enter '00' may cause system to reject to start operation. But this date is not using to operate the system, they use for data reference only.

- No Time Calculation Involved. This case is similar to above two cases. As long as there are no time calculation needed base on the Time and Date in the system. Some equipment utilize the internal clock to operate the system, the time and date is using for reference purpose only.

- Data Storage can use other mean to Verify the Date. As mention in the above cases, data storage is for reference only then it has low impact to the system. Some equipment save the log in the directory base on Day, Week, Month, Quarter, etc, although the date content inside the file is not capable of recognize the real date but they can be reference base on the directory name.

3. Non-Compliant and has high impact on system. If the system does fall into the low-impact category, it would be a high-impact system. To be more specific, the system that utilize the system calendar to do the time calculation will be consider high-impact. For instance, the wafer tracking system (PROMIS) is helping to calculate the work in Process (WIP). With the wrong date calculation, the shipment are in jeopardy.

4. Not Applicable (No Date Involved in the system). For instance, workbench, Chemical Sink, Gas Panel, etc.

Analysis

Using these four area of consideration, the equipment under Implant module for Not Y2K Compliance needed to be analyze again to fit into the new categories, they are:

1. Eaton – None of the equipment is Y2K Compliance.

Medium Current Implanter	
NV6200	2 Units
High Current Implanter	
NV10-80	3 Units
NV10-160	1 Unit
Total	6 Units

These 6 units having only Fluke Controller module that contain the time calculation and Record the time into the machine history and parameters log at a centralize system for these 6 equipment. This Fluke Controller is an isolate module to record the machine parameters and history only and send data to centralize data gathering system. The equipment can be operate without this Fluke Controller as well. Therefore, the impact of this module to the system is consider low.

Medium Current Implanter	
NV6200-AV	2 Units

In these two system the PC is 386 and 486 respectively, which are not Y2K compliance. The operating system and Application in these two units are identical and is not Y2K compliance due to the display of the time is wrong. The system do not utilize the date to calculate the equipment timing system. The system operation and function would not impact by the time and date. The data storage does not contains year digit. Therefore, the data will override each other when the time reach next year. Therefore, the impact of this system is consider low as well, due to the display problem.

2. Aneric – Pending for Investigation. At the field Service level say that it is Y2K Compliance, however, the Company do not have the official confirmation. In this

case, Implant module classified as Not Compliance but low impact due to the equipment pass the Sematech test Scenarios at Vendor's site but no confirmation yet. This would allow the Y2K team to trace the progress of the upgrade kit or any future change from Aneric.

3. KLA-Tencor – Not Y2K Compliance. The computer is base on non-standard 286 PC and contains proprietary storage cartridge. This system is not compliance in PC itself and the application. The impact would be the time stamp on the measurement report and storage. In this case, the system is capable of reference the day and date correctly if rollback the system year. Therefore, this system is consider low impact as well.

From all of the consideration above, the Y2K committee had reviewed the result of the analysis and agreed to classified as suggested by Implant group. Y2K team can tabulate the summary of all Fab1 equipment into the below table:

Fab1, Status of Y2K readiness

Vendor's reply, Y2K ?	Eqpt Qty	Impact, If not upgrade.	Qty	%
No (Not compliant)	124	Low	103	27.2%
		Hi	21	5.5%
Yes (Y2K compliant)	46		46	12.1%
Pending	17	Low	14	3.7%
		Hi	3	0.8%
NA	192		192	50.7%
Total	**379**		**379**	**100.0%**

Table 4.4 : Fab1 Equipment Y2K Status in Percentage with impact status

The Cost of the upgrade from the Vendor is needed to take into consideration as well. Although, the equipment has the low impact to the system, it would be nice if the system is Y2K Compliant. Reducing the number of the system that is non-compliant will also reduce the complication level that might occur in the future as well. By putting the information into the tabular format and sum up the total cost, Y2K team can make the decision and prioritize the equipment to upgrade base on cost as well.

This is the summary of the upgrade cost for equipment under Implant Module.

Model	Quantity	Upgrade Cost (USD)	Amount (USD)	Remark
NV6200	2	26,667.00	53,334.00	Using Fluke Controller
NV6200-AV	2	4,000.00	8,000.00	PC
NV10-80	3	26,667.00	80,001.00	Using Fluke Controller
NV10-160	1	26,667.00	26,667.00	Using Fluke Controller
Probemetric	1	250,000.00	250,000.00	No Upgrade - Only buy new equipment
Thermawave	1	800,000.00	800,000.00	No Upgrade - Only buy new equipment
		Total	1,218,002.00	

Table 4.5 : Implant Module Upgrade Cost Summary

However, after analyze the impact and cost carefully, none of them are having high impact to the system. As mention earlier the more compliant system would increase the safety margin the organization. However, there is another reason for decision not to upgrade majority of the system is because in 1999, the economic crisis in Asia make the Semiconductor growth reduced tremendously. CSM was affected by this crisis as well. Therefore, the minimal upgrade was approved.

In Implant module the analysis for upgrade can be summarize to these rules. The upgrade will be reasonable only:

1. System has high impact to organization or
2. Total upgrade cost for Implant module less than 12.5% of total upgrade cost. (This number get from assumption that each module has allocate equal upgrade budget, in this case Fab1 has 8 modules, therefore 1/8 is 12.5%)
3. Total Upgrade cost for Fab1 is not exceed management budget. (1% of production cost in 1997)

In Fab1 Implant case, the only reasonable upgrade is the 2 system of NV6200-AV, which cost only USD 8,000.00. It is less than 12.5% of USD 124,500 (12.5% = 15,562.5). In this case, the total upgrade cost is USD 124,500 and it is not exceed the management limit as well (1997 shipment is 103,000 wafers and cost per wafer is around USD 300, therefore 1% of production cost is USD 309,000).

The benefits from having these only two equipment year 2000 compliance with Sematech Approach are:

1. Reduce unforeseen risks that may happens – There are possibilities that unpredicted error might happens and cause the system to malfunction, especially in PC base. Since they contain more components contribute to the time calculation, such as BIOS, OS and Application. NV6200-AV having the capability to operate, control, monitor process, production recipe and store data within the system. Therefore, it has higher risk if the system crash everything will be lost.

2. Eliminate the resources allocation for the Contingency Plan for Compliance equipment. Since the equipment is certified by the Vendors, the resource required for prevention would greatly reduced to monitoring only.

Therefore, Y2K team can rearrange the Y2K Equipment database as follow:

DEPARTMENT	EQUIPMENT ID	TYPE OF MACHINE	MODEL	Year Qty	Cost US$	Impact if no upgrade	Vendo	Remarks
DIFFUSION								
No	01-PROM	Prometrix Spectramap	Spectramap SM2	1		Low	KLA	Obsolete m/c
	01-LASER	Laser Marker	Wafer Mark II	1	8,000	Hi	Lumonics	
Pending	01-CSS to 03-CSS	Apex Unix System	Hardware HP90(	3	66,000	Hi	Altus/KBTI	
Yes	01-SVG to 02-SVG	SVG Alloy Furnace	2606	2		Low	SVG	
	A1-TUBE A8-TUBE	BTU Furnace	7355X	8			KBTI	
	B1-TUBE to B8-TUBE	BTU Furnace	7355X	8			KBTI	
	C1-TUBE to C8-TUBE	BTU Furnace	7355X	8			KBTI	
	D1-TUBE to D8-TUBE	BTU Furnace	7355X	8			KBTI	
	02-TEL to 03-TEL	TEL Vertical Furnace	IW-6	2			TEL	
ETCH								
No	01-AMT83 to 03-AMT83	Metal Etcher	AMT8330	3		Low	Applied Mate ial	
	01, 02, 04 -TCP96	Metal Etcher	TCP9600BAC	3		Low	LAM	
	05-LAM44	Nitride Etcher	LAM4400	1		Low	LAM	
	01-LAM45 to 06-LAM45	Oxide Etcher	LAM4500	6		Low	LAM	
	01-LAM44 to 03-LAM44	Poly Etcher	LAM4400	3		Low	LAM	
	01-ASPEN	Resist Siripper	ASPEN II	1		Low	Anerics	
CLEAN TECH								
No	01-FSI to 09-FSI	CHEMFILL(CDM)	1000-2	9		Low	FSI	
	01-SAN to 03-SAN	PHOTO RESIST STRIPPER	CRS 6"	3		Hi	Sankyo	
HP								
No	H01-L384	LAM 384T	384T	1		Low	LAM	
	H01-1250	UV1250SE	1250SE	1		Low	KLA	
	H01-UT	Ultratech Titan Stepper	Titan	1		Low	Ultratech	
	H01-NORD TO H02-NORD	NORDIKO 8550	8550	2		Low	Nordiko	
Yes	01-NOV	NOVELLUSA CONCEPT I	C1-150D	1		Low	Novellus	
IMPLANT								
No	05-NV	High Current Implanter	NV10-160	1		Low	Eaton	
	01, 04, 07 -NV	High Current Implanter	NV10-80	3		Low	Eaton	
	02, 03, 06, 08-NV	Medium Current Implanter	NV-6200	4	8,000	Low	Eaton	
	02-PROM	Rs measurement	Ommimap	1		Low	KLA	
	01-THERM	Thermal Wave Unit measuremen	TP320	1		Low	Thermawave	
LITHO								
No	KLA	Overlay m/c	KLA5011	1		Low	KLA	
	PROMETRIX 200	Tencor	SM200/e	1		Low	KLA	
	01-S6000	SEM	SEM-S600□	1		Hi	Image Transform	
	01-S7000	SEM	SEM-S7000	1		Hi	Image Transform	
YIELD					40,000			Est. Cost
No	01-KLA25	100 MHz Pentium PC	KLA2552	1		Hi	KLA	
	01-KLA26	386 PC Plus Defect Review Mac	KLA2608	1		Hi	KLA	
	01-KLA21	386 Wafer Inspection	KLA2131E	1		Hi	KLA	
	01-REVIE	Defect Review M/C	EX500L	1		Hi	Image Transform	
	01 & 02 -INSPE	Laser Wafer Inspection M/c	TPC 8510	1		Hi	Image Transform	
THIN FILM								
No	02, 04-HEAT	AST RTP	2000	2		Low	AST	
	01-Excal	Excalibur HF Etch	EOS	1		Low	Metron	
	01-NOV	Novellus Concept One	C1-150D	1		Low	Novellus	
	04-PROM	Prometrix	FT530e	1	2,500	Hi	KLA	
Pending	01-FTIR	Nicolet Ftir	ECO-8	1		Low	Nicolet	
	01-THMCO to 02-THMCO	THERMCO	MYPRO CONTI	2		Low	SVG	
				103	124,500			

Table 4.6 : Fab1 Equipment Y2K Status base on Type and Cost of Upgrade

Keep in mind that all of these equipment are needed to test before finalize the list. This test would be done in the Implementation phase. The reason Y2K Team need to do the initial Y2K test is because of CSM try to reduce the chance of the system not compliant and cause CSM to disrupt the services to the customer. Another reason is as mention earlier that the Compliant standard is may not be the same standard and different version.

Compliant Approach

The main purpose of the Y2K project is to ensure that all of its key systems are Year-2000 ready and customers will experience no deterioration in quality or disruption in service as a result of Year-2000 issues.

Therefore, the system that determined to be mission critical systems is necessary to be Y2K Compliant before the specified critical date. This can be done by following the test scenarios of Sematech Version 2.0, which CSM use as a guideline. In this category include the Compliant Systems that needed to test out and the Non-Compliant and has high impact. There are two ways Y2K Team handle the non-compliant systems, Replacement (Upgrade) if the solution is available and Elimination (Obsolescence) if there is no alternative. The systems that are not applicable are not a concern for the whole system, since there is no internal time calculation and no interaction with external.

The problematic systems are the system that is not Y2K Compliant and has low impact are need to analyze case by case for the alternative solution. Base on the initial impact analysis in previous section, Y2K Team can rearrange the new category. This is due to the fact that it is not feasible for the upgrade Financially or Technically. In CSM Fab1, the approaches are separated into two categories, the Y2K Compliant and Y2K Ready.

Y2K Compliance is use for equipment that fully meet Sematech Version 2.0 test scenarios. However, due to many detail tests in the Sematech Scenarios are not applicable to some of the equipment or is not a normal working condition. Those tests are :

1. Test related to verify system that fail to recognize the correct calendar for leap year. Since the equipment in Semiconductor is not utilizing the special days (Holidays, weekend, business day), the leap year would be another operating day. If the system only fail to update the correct date, but it still operate with normal manner, then it is year 2000 Ready. (Test 2, 3, 5, 7, 8, 10, 12)

2. Test related to verify system that fail to recognize the correct calendar for after reboot (For new year of 1999, 2000, 2001 and November 9, 1999). It is the nature of the manufacturing system that it would operate 24 hours a day. The system is never shut-off. If the system does not recognize the January 1, 1999, 2000, 2001 or November 9, 1999 after reboot and operate in normal manner and capable of setting to the correct date manually , then system is acceptable. Therefore, it is quite safe to operate equipment , however, need to bear in mind the correct date after each reboot. This problem can be resolve easily by roll back the system clock. (Test 4, 9, 24, 27)

3. Tests related to Network. This is because Fab1 is an oldest Fab among CSM's Fab, the network of production equipment is not implemented at that time. Therefore, the network related test failure is acceptable and safe for Fab1. (Test 16, 17, 18, 19, 20)

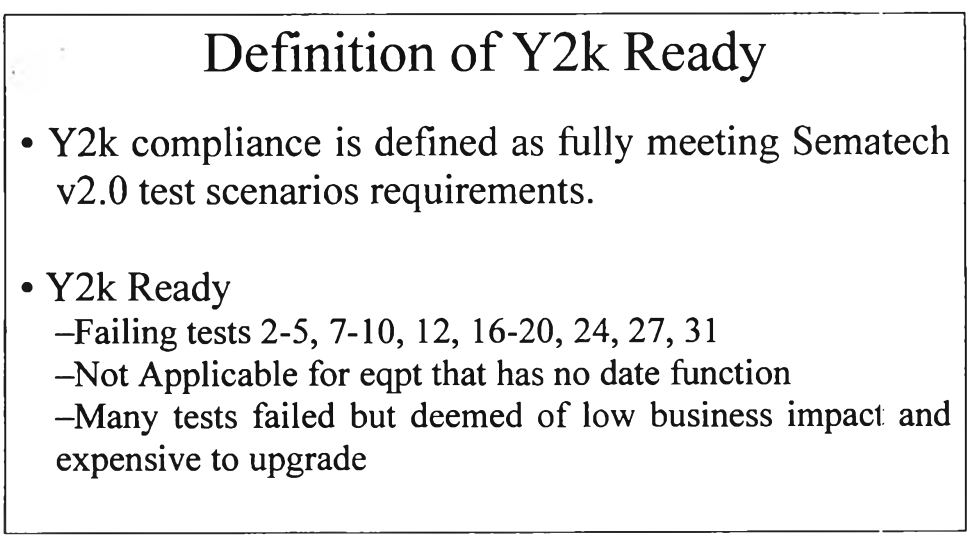


Figure 4.7 : Definition of Y2K Ready

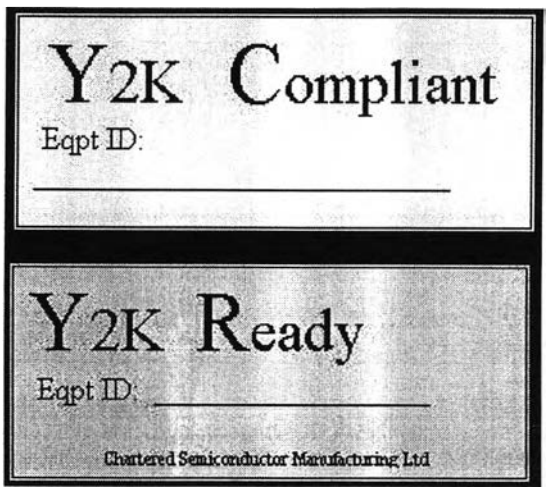


Figure 4.8 : Y2K Sticker Tag

This is the clear definition that serve as a guideline for the Y2K team to categorize the Equipment. By setting up a new equipment category (Y2K Ready), CSM can dramatically reduce cost and effort to make non-critical equipment compliant. At the same time, make the organization ready for year 2000. However, this can introduce risks to the organization. The system that has low impact to the organization might have some unknown impact on the other systems. This is the calculated risk, therefore, in the next chapter, Y2K Team will discuss more in detail of the Contingency plan.

The examples of the alternative solutions are:

1. Windowing. This method is the method adapt by the Y2K team from the Window Logic Fix Method. In this case, CSM do not fix the logic of interpreting the Window, but end user need to keep in mind of the logic changed. It is the fact that the simplest way to avoid the year 2000 problematic date is to slide the window range to the desired range prior to the year 2000. This can be done by Roll Back the System Date to the Correct Operational Window. The most popular dates chosen are base on the:

    - Day, date, Leap Year are correct but wrong Year (Done by Roll back the year to 28 years prior). This is the most desirable date to rollback. This date can represent Day, Date, Leap Year correctly, which in most case

are the most important data. However, some system have limitation of rolling back the date that far.

- Date, Leap Year are Correct but Wrong Day and Year (Done by Rollback the year to 4, 8, 12, 16, 20, 24 years prior). This is another alternative to the first solution. This range would be suitable for the operation that required date to be accurate.
- Correct Day, But wrong Date, Year and Leap Year. (Done by Rollback the year to any year prior and choose the correct date). This solution is suitable for the operation that required the Day of the week to be accurate for the operation. However, this solution will not work for date reference.

These three sliding window range are need to be analyze, which is suitable for the individual system base on their advantages and disadvantages.

2. Elimination (Obsolete). This method is just simply get rid of the system that is not compliant and there is no alternative solution.

3. Replacement (Upgrade). This replacement method is having two type, they are Upgrade (by Vendor) and Replace the non-compliant module (Internal). For instance, the PC in the system is not Y2K Compliant, therefore change the Machine would make the whole system Y2K Compliant.

Resource Allocation

Resources need to be planned in advance for the Implementation, Correction and Final Audit Phases as well. However, the Implementation and Correction are either done by Vendor or Internal staff which is consider transparent to the project. For internal staff, need to keep in mind that they are working part-time for the Y2K Project. Therefore, the task allocate to them would be on the expense of the company. The recommended solution for this resource utilization is ask the Y2K Service provider to complete the test and guarantee by them. However, the initial test for all of the system are required to carry out by the internal staff before confirm the equipment status according to the equipment list in the previous section.

From the list that Y2K team get, can determining the Cost of the upgrade by filling in the information from the Vendors' upgrade cost and the timeframe that solution available. The upgrade will be done by the Y2K Service Provider, in this case, it is the Equipment Vendor. However, some of the upgrade cost are transparent to the operation module due to the PC upgrade are charge under IT. The internal staff are also need to do the testing and audit the system afterward. This is the table that filling in the upgrade cost from Vendors for the Equipment that required to upgrade.

At this stage, most of the vendors do not have the clear commitment for the solution availability. The only information available would be the estimated cost of the upgrade.

Est cost of upgrade/Service charges

Y2K ?	Dept	Equip ID	Item	Model	Qty	Estimated Cost S$	Vendor's name	Impact / Remark
Pending for Vendor (High Impact)								
	Diffusion							
		01 to 03 -CSS	Apex Unix System	Hardware HP9000 series	3	85,680	ALTUS / KOKUSAI	This controller is heart of 32 Furnace Tubes Operation. Vendor has no potential business in CSM. If controller is affected by Y2K bug, whole Diffusion operation will be affected.
					3	**85,680**		
Pending for Vendor (Low Impact)								
	HP Inkjet Ops							
		H01-LASR	LASERMATE SIGMA CLEAN	SIGMA CLEAN	1	10,000	Lumonics	
		H01to H02 - NORD	NORDIKO 8550	8550	2	20,000	Nordiko	
					3	**30,000**		
No (High Impact)								
	Clean Tech							
		02 & 03 -DNS	DNS-ORGANIC	WS-W625	2	20,000	DNS	M/C hanged while rollover to year 2000. Set back the date before year 2000 and continue.
		01-DNS	DNS-RCA	WS-620C	1	10,000	DNS	M/C hanged while rollover to year 2000. Set back the date before year 2000 and continue.
		01to 03 -SAN	PHOTO RESIST STRIPPER	CRS 6"	3	18,000	Sankyo	
	Diffusion							
		01 & 02 - LASER	Laser Marker	Wafer Mark II	2	25,000	Lumonics	
	Implant							
		06 & 08-NV	PC & iRMX	NV6200-AV	2	14,000	Eaton	
	Litho							
		01-S6000	SEM	SEM-S6000	1	5,000	Image Transform / Hitachi	Vendor is waiting for confirmed PO to work on solution. Lead time will be 3 to 4 months. Hasn't received impact infc from vendor.
		01-S7000	SEM	SEM-S7000	1	5,000	Image Transform / Hitachi	Vendor is waiting for confirmed PO to work on solution. Lead time will be 3 to 4 months. Hasn't received impact infc from vendor.
	Thin film							
		01-NOV	Novellus Concept One	C1-150D	1	18,000	Novellus	Requires Processor upgrade (US$ 9795). Software upgrade is FOC. When rollover to year 2000, date changed to ????. So far no report of File/Program corruption.
	Yield Engr					70,000		
		01-KLA25	100 MHz Pentium PC	KLA2552	1		KLA-tencor	Reports are critical for documentation (audit trail) .
		01-KLA26	386 PC Plus Defect Review Machine	KLA2608	1		KLA-tencor	Reports are critical for documentation (audit trail) .
		01-KLA21	386 Wafer Inspection	KLA2131E	1		KLA-tencor	Reports are critical for documentation (audit trail) .
		01-REVIE	Defect Review M/C	EX500L	1		Image Transform / Inspex	Reports are critical for documentation (audit trail) .
		01 & 02 - INSPEX	Laser Wafer Inspection M/c	TPC 8510	1		Image Transform / Inspex	Reports are critical for documentation (audit trail) .
					18	**185,000**		
				Total Est. Cost	**(S$)**	**$300,680**	(US$168K)	

Table 4.7 : Estimate Cost of Upgrade/Service

Detail Work plan

At this step, the Y2K team need to put all of the plans and resources into action plan for the last three phases. At the initial of the implementation phase, the Y2K team need to do the Year 2000 Operability Check and the Testing.

Year 2000 Operability - Check From the information about the Y2K Compliant from Vendor, Y2K team may need to investigate more detail of the module of the system that may affect by the date calculation. With this information in advance, the Y2K team can prepare the Contingency Plan, Disaster Recovery Plan and Test Observation. With the awareness of the problem may exist in some module the attention would be put to observe the problem that may occur at that module.

Testing and Re-Deploy Application – Testing can be done concurrently with the Year 2000 Operability Check. However, some equipment need to have the understanding of the equipment behavior before start the testing. Therefore, the arrangement is needed before conduct the testing. The testing can be done in many ways. The most preferred way is to test all of the equipment. However, in real operation environment, the testing time will interrupt the operation and cause the production to stop, which may result in miss shipment. Therefore, testing can be done at least once for each type of the equipment. Or it can be done by the equipment vendor with their machine at their site to certify their machine if it is compliant with CSM Standard. This is the most recommendable method. Re-Deploy applications to the equipment owner that need to upgrade their applications at the end of the testing stage is necessary. This is due to the time they need to study the application before they start to use it in the next phase. During testing, the observation and happened is necessary to take into the consideration of preparing the disaster recovery and contingency plan.

Verification – The Equipment that is Year 2000 Compliant is needed to classify as Year 2000 Compliant in the database. It is important to eliminate the equipment that passed the test as fast as possible to eliminate the further unnecessary effort for the Project. This step is quite straight forward. The only confusion that might occur is the Year 2000 Ready Equipment. As specified earlier, the Year 2000 Ready equipment are classify as a group by itself, since it need attention during the contingency plan more than Year 2000 Compliant group.

Correction – The Equipment that fail the Year 2000 Test scenarios and do not fall into the Year 2000 Ready Category is need the correction. However, this step can be execute only after re-deploy the patches, fixes, or upgrade from the equipment vendor. The Disaster recovery plan needed to execute during this phase. Since there would be a change in the Software or Hardware that might cause the system to perform abnormal.

Final Audit – This step should be perform by external Year 2000 Service Provider to ensure the compatibility and standardization across the industry. This would also serve as a check point to the Y2K Team for the Project Completion.

Documentation and Contingency Plan – This step is the final step that Y2K team need to collect and review all of the information that the team has to plan out the necessary scenario for the real situation during the Millennium Crossover.

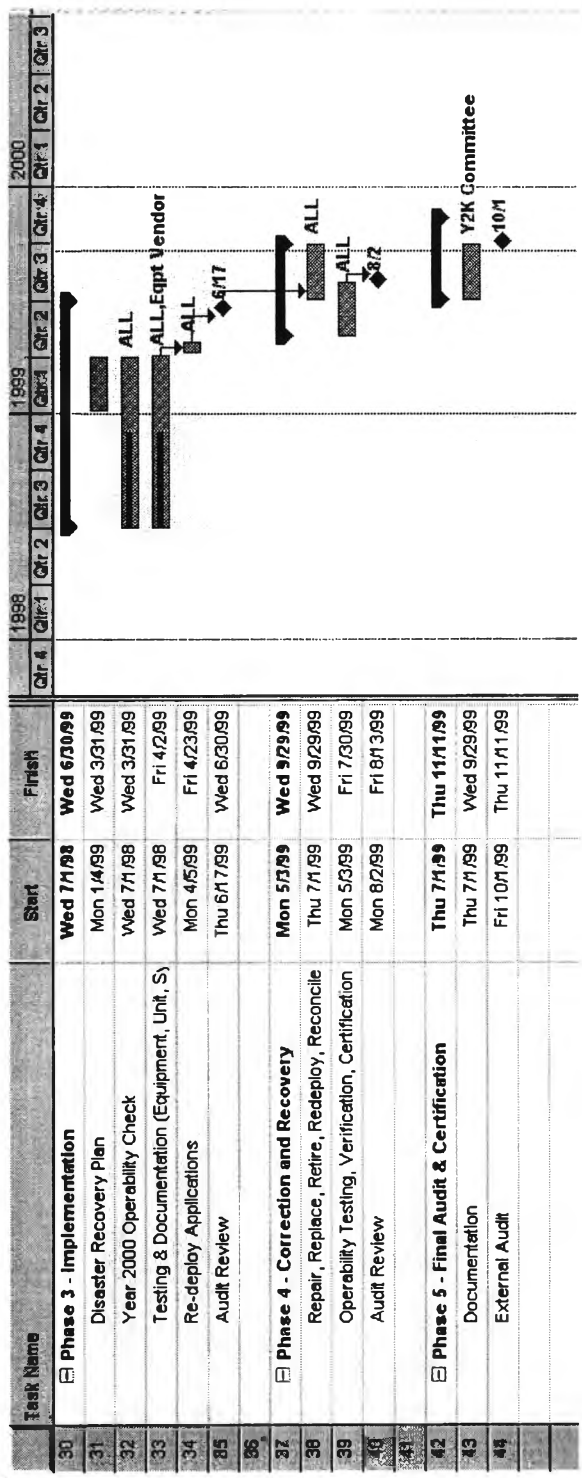


Figure 4.9 : Detail Plan for last three phases

Implementation

In the real Implementation stage, the Y2K team need to arrange the equipment into 2 major implementation category. The first one is the Compliant equipment that need to test out. This equipment would need to verify to ensure the CSM standard are met. This group can be test out without any information added from the vendor. These equipment are consider having low risk to the organization. By using this group as a training ground for the Y2K team to get familiarize with the test methodology and tracking the status of the whole would gain the Y2K team the experience to manage the more complex situation in the future.

As the time goes by, the Y2K team would be able to test the system that might have the problem during the testing. However, with the information from the vendor provided, the Y2K team can predict the test result that might cause the problem and do some precaution before start the tests. Most of the problem come from the software. Therefore, the backup of the data and history log is important before performing the tests.

This table is the tracking database for all of the systems after classification in Fab 1

Fab1, Status of Y2K readiness

Vendor's reply, Y2K ?	Eqpt Qty	Impact, If not upgrade.	Qty	%
No (Not compliant)	124	Low	103	27.2%
		Hi	21	5.5%
Yes (Y2K compliant)	46		46	12.1%
Pending	17	Low	14	3.7%
		Hi	3	0.8%
NA	192		192	50.7%
Total	**379**		**379**	**100.0%**

Table 4.8 : Summary of Y2K Inventory Status

The Flowchart below is the example of the Testing of AMHS (Automatic Material Handling System) that Fab 3 and SMP use as a guideline to utilize vendor to test the equipment. This is the most ideal case, however, most of the older Fab may have

problem request for this service, due to the older Fab is not their potent al customer. Therefore, they have to prioritize their limited resource to newer Fab first.

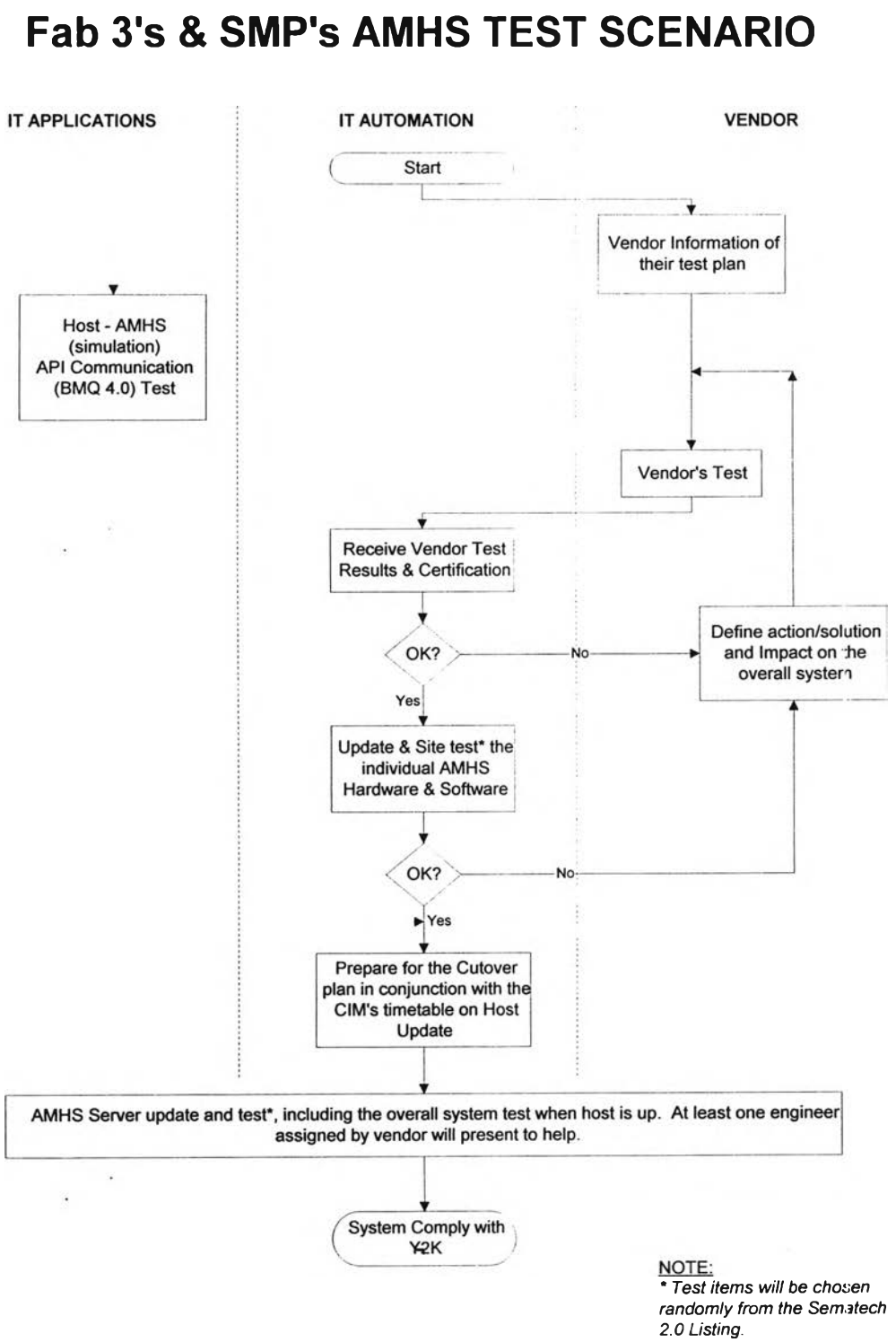


Figure 4.10 : Fab3 and SMP AMHS's test Scenarios

For Implant module, the test is arrange according to the schedule below. This schedule is arrange by Implant group to coincide with the PM activity to prevent and ensure the quality before release the equipment back to production. The testing would be done before the Preventive Maintenance in case of any problem exist, the maintenance team can fix the problem right away. This would make the downtime transparent to the operation.

The Testing is done in only 4 equipment, one for Medium Current Implanter (NV6200), one for High Current Implanter (NV10-80), one for Probematric and the last one for Thermawave. This is because of the knowledge that all of the rest of the Implanter machine is having the same subsystem, configuration. Implant module did not test all of the tests procedure in Sematech Test Scenarios Version 2.0. This is because of Fab1 Equipment do not have the network connection between the equipment. Therefore the test 16 to 19 in Sematech Test Scenarios is not applicable for Fab1. Another test is test 20, this test is not applicable for Implanter as well. This is because all of the equipment in Implant module do not have the routine data purge system. The data purge system have to initiate manually.

The table below is the database of the testing Progress base on the Tested and to be tested in percentage of the overall equipment. This table show the amount of the progress during the timeline in this project (5 Oct 98).

Vendor's reply, Y2K ?	**Test Criteria**	**Tested**	**%**	**To be tested**	**%**
No (Not compliant)	To confirm impact	43	11.3%	60	15.8%
	SEMATECH Ver.2	7	1.8%	14	3.7%
Yes (Y2K compliant)	SEMATECH Ver.2	5	1.3%	41	10.8%
Pending	To confirm impact	9	2.4%	5	1.3%
	SEMATECH Ver.2	0	0.0%	3	0.8%
NA					
Total		**64**	**16.9%**	**123**	**32.5%**

Table 4.9 : Y2K Status Progress as at October 5, 1998.

From this database, Y2K team can track the status and monitor the progress of the project on regular basis for the Equipment to be tested. This is due to the fact that the progress tracking is required to compare in percentage of the overall equipment. In CSM case, there are milestone set at the end of each month to track the progress of the project against the projected progress. Monitoring and control of the progress is crucial in order to make the whole project finish in Time. By breaking down the status of the equipment in the To be tested category, Y2K team can classify into

- Waiting For Management Decision
- Testing in Progress
- Pending For Testing

With further classification of the equipment status would give the Y2K team monitoring the status with better understanding of the potential delay that might cause the project to delay. For instance, the equipment in the table below are waiting for the management decision for 48% at Oct 5, 1998. However, it is relatively early in the project and the progress is ahead of the projected progress in October. Therefore, it is alright to pending for the management decision. But it would be a growing concern because if the management do not want to upgrade and left no time for Y2K team to Correct the problem within time.

Prioritizing the equipment to be tested is another concern that need to take into consideration. The equipment that has high impact to the organization is needed to have the highest attention in testing stage to ensure the compliant could be achieve before the millennium crossover.

Summary of outstanding eqpt to be tested as at Oct 5, '98.

Vendor's reply, Y2K ?	Impact, If not upgrade.	Eqpt Qty to be tested	Waiting for Mgmt decision related to expenses (Upgrade & service charges).	Testing in progress	Pending for Testing
No (Not compliant)	Low	60	4	27	29
	Hi	14	14	0	0
Yes (Y2K compliant)		41	38	1	2
Pending	Low	5	0	0	5
	Hi	3	3	0	0
		123	59	28	36
			48.0%	22.8%	29.3%

Table 4.10 : Summary of Outstanding Equipment to be tested as at October 5, 1998.

Prioritizing is necessary to determined and it should be done by the Y2K member not the management. This is because of the fact that this project is a part-time project. The interdisciplinary team are comprise of the member from all of the modules in the Fab. They may need to do other more important to their responsibility. Therefore, fully utilize the team member time is necessary. The arrangement that done by the team member would ensure that they can avoid their busy time. Therefore, the success of the testing would be higher.

From the Table below is the example of the testing schedule of the equipment in the database excluding the 'Not Applicable'. With the detail list of all of the equipment in the database, the Y2K team can arrange the time and quantity for the equipment to test out.

Notice that the test plan is trying to finish the testing phase by the forth quarter, but the master plan is due at the end of first quarter. This is due to the fact that Fab 1 has equipment that is 'Not Applicable' more than other fab, therefore the time Fab 1 spent to test out the system should be relatively lower than the rest of the other fab. Another reason is that in real life the project tend to slip out of the time limit By reducing the allowance of the phase completion would greatly reduce the risk that might delay the project.

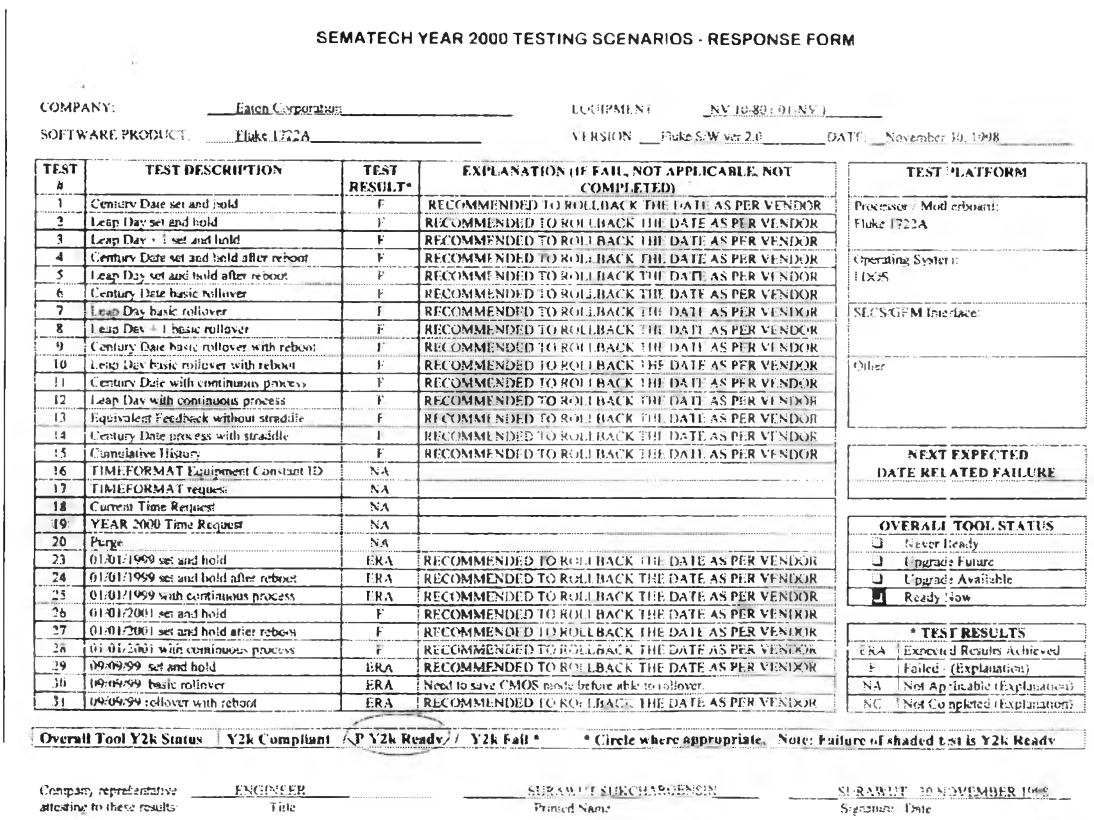
PARTME	EQUIPMENT ID	TYPE OF MACHINE	MODEL	Year Qty	98 Q4 Oct	Nov	Dec	99 Q1 Jan	Feb	Mar	Q2 Apr	May	Jun	Cost US$	Impact if no upgrade	Vendor	Remarks
DIFFUSION																	
No	01-PROM	Prometrix Spectramap	Spectramap SM2	1											Low	KLA	Obsolete m/c
	01-LASER	Laser Marker	Wafer Mark II	1										8,000	Hi	Lumonics	
Pending	01-CSS to 03-CSS	Apex Unix System	Hardware HP90(	3										66,000	Hi	Altus/KBTI	
Yes	01-SVG to 02-SVG	SVG Alloy Furnace	2606	2											Low	SVG	
	A1-TUBE A8-TUBE	BTU Furnace	7355X	8												KBTI	
	B1-TUBE to B8-TUB	BTU Furnace	7355X	8												KBTI	
	C1-TUBE to C8-TUB	BTU Furnace	7355X	8												KBTI	
	D1-TUBE to D8-TUB	BTU Furnace	7355X	8												KBTI	
	02-TEL to 03-TEL	TEL Vertical Furnace	IW-6	2												TEL	
ETCH																	
No	01-AMT83 to 03-AM	Metal Etcher	AMT8330	3											Low	Applied Material	
	01, 02, 04 -TCP96	Metal Etcher	TCP9600BAC	3											Low	LAM	
	05-LAM44	Nitride Etcher	LAM4400	1											Low	LAM	
	01-LAM45 to 06-LAN	Oxide Etcher	LAM4500	6											Low	LAM	
	01-LAM44 to 03-LAN	Poly Etcher	LAM4400	3											Low	LAM	
	01-ASPEN	Resist Stripper	ASPEN II	1											Low	Anerics	
CLEAN TECH																	
No	01-FSI to 09-FSI	CHEMFILL(CDM)	1000-2	9											Low	FSI	
	01-SAN to 03-SAN	PHOTO RESIST STRIP	CRS 6"	3											Hi	Sankyo	
HP																	
No	H01-L384	LAM 384T	384T	1											Low	LAM	
	H01-1250	UV1250SE	1250SE	1											Low	KLA	
	H01-UT	Ultratech Titan Stepper	Titan	1											Low	Ultratech	
	H01-NORD TO H02-	NORDIKO 8550	8550	2											Low	Nordiko	
Yes	01-NOV	NOVELLUSA CONCE	C1-150D	1											Low	Novellus	
IMPLANT																	
No	05-NV	High Current Implanter	NV10-160	1											Low	Eaton	
	01, 04, 07 -NV	High Current Implanter	NV10-80	3											Low	Eaton	
	02, 03, 06, 08-NV	Medium Current Implan	NV-6200	4										8,000	Low	Eaton	
	02-PROM	Rs measurement	Ommimap	1											Low	KLA	
	01-THERM	Thermal Wave Unit mea	TP320	1											Low	Thermawave	
LITHO																	
No	KLA	Overlay m/c	KLA5011	1											Low	KLA	
	PROMETRIX 200	Tencor	SM200/e	1											Low	KLA	
	01-S6000	SEM	SEM-S600□	1											Hi	Image Transform	
	01-S7000	SEM	SEM-S7000	1											Hi	Image Transform	
YIELD														40,000			Est. Cost
No	01-KLA25	100 MHz Pentium PC	KLA2552	1											Hi	KLA	
	01-KLA26	386 PC Plus Defect Rev	KLA2608	1											Hi	KLA	
	01-KLA21	386 Wafer Inspection	KLA2131E	1											Hi	KLA	
	01-REVIE	Defect Review M/C	EX500L	1											Hi	Image Transform	
	01 & 02 -INSPE	Laser Wafer Inspection I	TPC 8510	1											Hi	Image Transform	
THIN FILM																	
No	02, 04-HEAT	AST RTP	2000	2											Low	AST	
	01-Excal	Excalibur HF Etch	EOS	1											Low	Metron	
	01-NOV	Novellus Concept One	C1-150D	1											Low	Novellus	
	04-PROM	Prometrix	FT530e	1										2,500	Hi	KLA	
Pending	01-FTIR	Nicolet Ftir	ECO-8	1											Low	Nicolet	
	01-THMCO to 02-TH	THERMCO	MYPRO CONTI	2											Low	SVG	
				103										124,500			

Table 4.11 : Equipment Database with the Testing Timeline

With the cost of the known equipment upgrade, tracking of the cost occur would give the Y2K team a signal to get the budget for the upgrade. Although the upgrade would be done in the next phase, knowing the budget needed is necessary for Y2K to get the budget approve before the upgrade arrive.

This is the summary of the test result in the Implant module. As mention earlier, in Implant there are only four equipment to be test out. According to the time schedule

mentioned in the above diagram, Implant equipment are tested and the result in the Y2K response form (Appendix C) are as below:



SEMATECH YEAR 2000 TESTING SCENARIOS - RESPONSE FORM

COMPANY: Eaton Corporation EQUIPMENT: NV 10-80 (01-NV)

SOFTWARE PRODUCT: Fluke 1722A VERSION: Fluke S/W ver 2.0 DATE: November 30, 1998

TEST #	TEST DESCRIPTION	TEST RESULT*	EXPLANATION (IF FAIL, NOT APPLICABLE, NOT COMPLETED)
1	Century Date set and hold	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
2	Leap Day set and hold	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
3	Leap Day + 1 set and hold	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
4	Century Date set and hold after reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
5	Leap Day set and hold after reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
6	Century Date basic rollover	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
7	Leap Day basic rollover	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
8	Leap Day + 1 basic rollover	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
9	Century Date basic rollover with reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
10	Leap Day basic rollover with reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
11	Century Date with continuous process	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
12	Leap Day with continuous process	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
13	Equivalent Feedback without straddle	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
14	Century Date process with straddle	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
15	Cumulative History	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
16	TIMEFORMAT Equipment Constant ID	NA	
17	TIMEFORMAT request	NA	
18	Current Time Request	NA	
19	YEAR 2000 Time Request	NA	
20	Purge	NA	
23	01/01/1999 set and hold	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
24	01/01/1999 set and hold after reboot	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
25	01/01/1999 with continuous process	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
26	01/01/2001 set and hold	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
27	01/01/2001 set and hold after reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
28	01/01/2001 with continuous process	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
29	09/09/99 set and hold	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
30	09/09/99 basic rollover	ERA	Need to save CMOS mode before able to rollover.
31	09/09/99 rollover with reboot	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR

TEST PLATFORM
Processor / Motherboard: Fluke 1722A
Operating System: DOS
SECS/GEM Interface:
Other

NEXT EXPECTED DATE RELATED FAILURE

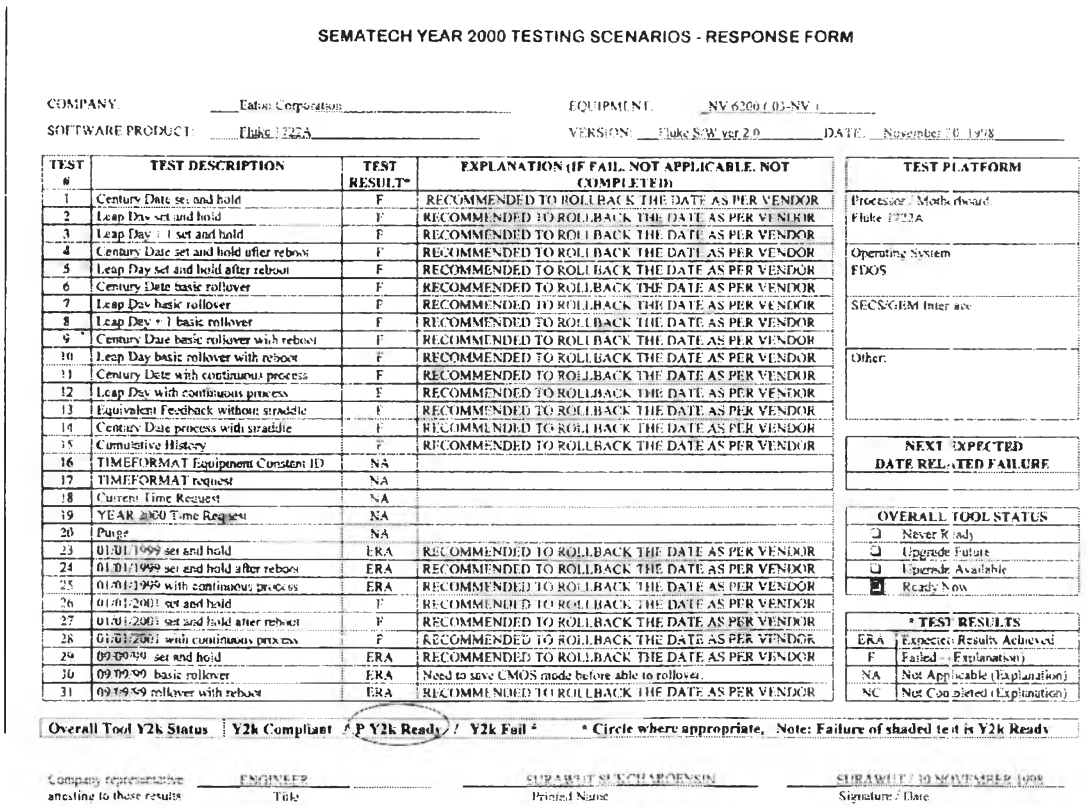
OVERALL TOOL STATUS
☐ Never Ready
☐ Upgrade Future
☐ Upgrade Available
☑ Ready Now

* TEST RESULTS	
ERA	Expected Results Achieved
F	Failed - (Explanation)
NA	Not Applicable (Explanation)
NC	Not Completed (Explanation)

Overall Tool Y2k Status: Y2k Compliant / (P Y2k Ready) / Y2k Fail * * Circle where appropriate. Note: Failure of shaded test is Y2k Ready

Company representative attesting to these results: ENGINEER (Title) SURAWUT SUKCHAROENSIN (Printed Name) SURAWUT 30 NOVEMBER 1998 (Signature / Date)

Figure 4.11 : Test Result of High Current Implanter (NV10-80)



SEMATECH YEAR 2000 TESTING SCENARIOS - RESPONSE FORM

COMPANY: Eaton Corporation — EQUIPMENT: NV6200 (.03-NV.)

SOFTWARE PRODUCT: Fluke 1722A — VERSION: Fluke S/W ver 2.0 — DATE: November 10, 1998

TEST #	TEST DESCRIPTION	TEST RESULT*	EXPLANATION (IF FAIL, NOT APPLICABLE, NOT COMPLETED)
1	Century Date set and hold	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
2	Leap Day set and hold	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
3	Leap Day + 1 set and hold	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
4	Century Date set and hold after reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
5	Leap Day set and hold after reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
6	Century Date basic rollover	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
7	Leap Day basic rollover	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
8	Leap Day + 1 basic rollover	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
9	Century Date basic rollover with reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
10	Leap Day basic rollover with reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
11	Century Date with continuous process	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
12	Leap Day with continuous process	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
13	Equivalent Feedback without straddle	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
14	Century Date process with straddle	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
15	Cumulative History	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
16	TIMEFORMAT Equipment Constant ID	NA	
17	TIMEFORMAT request	NA	
18	Current Time Request	NA	
19	YEAR 2000 Time Request	NA	
20	Purge	NA	
23	01/01/1999 set and hold	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
24	01/01/1999 set and hold after reboot	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
25	01/01/1999 with continuous process	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
26	01/01/2001 set and hold	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
27	01/01/2001 set and hold after reboot	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
28	01/01/2001 with continuous process	F	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
29	09/09/99 set and hold	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR
30	09/09/99 basic rollover	ERA	Need to save CMOS mode before able to rollover.
31	09/09/99 rollover with reboot	ERA	RECOMMENDED TO ROLLBACK THE DATE AS PER VENDOR

TEST PLATFORM
Processor / Motherboard: Fluke 1722A
Operating System: FDOS
SECS/GEM Interface:
Other:

NEXT EXPECTED DATE RELATED FAILURE

OVERALL TOOL STATUS	
☐	Never Ready
☐	Upgrade Future
☐	Upgrade Available
☑	Ready Now

* TEST RESULTS	
ERA	Expected Results Achieved
F	Failed – Explanation)
NA	Not Applicable (Explanation)
NC	Not Completed (Explanation)

Overall Tool Y2k Status | Y2k Compliant / P Y2k Ready / Y2k Fail * | * Circle where appropriate, Note: Failure of shaded test is Y2k Ready

Company representative attesting to these results: ENGINEER (Title) — SURAWUT SUECHAROENSIN (Printed Name) — SURAWUT / 30 NOVEMBER 1998 (Signature / Date)

Figure 4.12 : Test Result of Medium Current Implanter (NV620C)

SEMATECH YEAR 2000 TESTING SCENARIOS - RESPONSE FORM

COMPANY: KLA-Tencor | EQUIPMENT: Omnimap Prometrix RS55e (02-PROM)

SOFTWARE PRODUCT: Omnimap | VERSION: ST-4.2 | DATE: November 25, 1998

TEST #	TEST DESCRIPTION	TEST RESULT*	EXPLANATION (IF FAIL, NOT APPLICABLE, NOT COMPLETED)
1	Century Date set and hold	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
2	Leap Day set and hold	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
3	Leap Day + 1 set and hold	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
4	Century Date set and hold after reboot	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
5	Leap Day set and hold after reboot	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
6	Century Date basic rollover	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
7	Leap Day basic rollover	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
8	Leap Day + 1 basic rollover	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
9	Century Date basic rollover with reboot	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
10	Leap Day basic rollover with reboot	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
11	Century Date with continuous process	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
12	Leap Day with continuous process	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
13	Equivalent Feedback without straddle	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
14	Century Date process with straddle	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
15	Cumulative History	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
16	TIMEFORMAT Equipment Constant ID	NA	
17	TIMEFORMAT request	NA	
18	Current Time Request	NA	
19	YEAR 3000 Time Request	NA	
20	Purge	NA	
23	01/01/1999 set and hold	P	
24	01/01/1999 set and hold after reboot	P	
25	01/01/1999 with continuous process	P	
26	01/01/2001 set and hold	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
27	01/01/2001 set and hold after reboot	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
28	01/01/2001 with continuous process	F	ROLL BACK DATE AS PER VENDOR RECOMMEND
29	09/09/99 set and hold	P	
30	09/09/99 basic rollover	P	
31	09/09/99 rollover with reboot	P	

TEST PLATFORM

Processor / Motherboard:

Operating System:

SECS/GEM Interface: NA

Other:

NEXT EXPECTED DATE RELATED FAILURE

OVERALL TOOL STATUS

- ☐ Never Ready
- ☐ Upgrade Future
- ☐ Upgrade Available
- ☒ Ready Now

*** TEST RESULTS**

ERA	Expected Results Achieved
F	Failed - (Explanation)
NA	Not Applicable (Explanation)
NC	Not Completed (Explanation)

Overall Tool Y2k Status | **Y2k Compliant** | **A/P Y2k Ready** | **Y2k Fail** * | * Circle where appropriate. Note: Failure of shaded test is Y2k Ready

Company representative attesting to these results: ENGINEER (Title) | SUKAWUT SUKCHAROENSIN (Printed Name) | _____ (Signature / Date)

Figure 4.13 : Test Result of Omnimap Probematrix

SEMATECH YEAR 2000 TESTING SCENARIOS - RESPONSE FORM

COMPANY: Aneng EQUIPMENT: Therma-wave TP-320 (01-wave)

SOFTWARE PRODUCT: IMS VERSION: 4.05 A DATE: December 7, 1998

TEST #	TEST DESCRIPTION	TEST RESULT*	EXPLANATION (IF FAIL, NOT APPLICABLE, NOT COMPLETED)
1	Century Date set and hold	P	
2	Leap Day set and hold	F	CANNOT SET TO THIS DATE
3	Leap Day + 1 set and hold	P	
4	Century Date set and hold after reboot	P	
5	Leap Day set and hold after reboot	F	CANNOT SET TO THIS DATE
6	Century Date basic rollover	P	
7	Leap Day basic rollover	P	
8	Leap Day + 1 basic rollover	F	CANNOT SET TO LEAP YEAR
9	Century Date basic rollover with reboot	P	
10	Leap Day basic rollover with reboot	P	
11	Century Date with continuous process	P	
12	Leap Day with continuous process	P	
13	Equivalent Feedback without straddle	P	
14	Century Date process with straddle	P	
15	Cumulative History	P	
16	TIMEFORMAT Equipment Constant ID	NA	
17	TIMEFORMAT request	NA	
18	Current Time Request	NA	
19	YEAR 2000 Time Request	NA	
20	Purge	NA	
23	01/01/1999 set and hold	P	
24	01/01/1999 set and hold after reboot	P	
25	01/01/1999 with continuous process	P	
26	01/01/2001 set and hold	P	
27	01/01/2001 set and hold after reboot	F	
28	01/01/2001 with continuous process	F	
29	09/09/99 set and hold	P	
30	09/09/99 basic rollover	P	
31	09/09/99 rollover with reboot	P	

TEST PLATFORM

Processor / Motherboard:

Operating System:

SECS/GEM Interface: NA

Other:

NEXT EXPECTED DATE RELATED FAILURE

OVERALL TOOL STATUS

- ☐ Never Ready
- ☐ Upgrade Future
- ☐ Upgrade Available
- ☑ Ready Now

*** TEST RESULTS**

ERA	Expected Results Achieved
F	Failed (Explanation)
NA	Not Applicable (Explanation)
NC	Not Completed (Explanation)

Overall Tool Y2k Status | **Y2k Compliant** / **Y2k Ready** / **Y2k Fail** * | * Circle where appropriate. Note: Failure of shaded test is Y2k Ready

Company representative attesting to these results: SENIER ASSOCIATE ENGINEER (Title) SOH BIN TECK (Printed Name) _____ (Signature / Date)

Figure 4.14 : Test Result of Thermawave (TP-320)

The test results of these four equipment are as expected from the reply from the vendors. Equipment NV10-80, NV6200, and Probemetrix cannot rollover to year 2000. From the previous analysis, these system would give the wrong date stamp to the series of data. Therefore, the interpretation of the wrong data might lead to misinterpretation of the system behavior. The wrong date does not effect any of the equipment operation at all. Hence, the decision to rollback the system clock to make the system Y2K Ready is done after carefully analyze the impact of the system clock to the system. All of these equipment are effected only the display and storage of the date. With the capability to trace the date reference in the system, the problem of wrong date is manageable. Therefore, Implant module decide not to upgrade the system and classified these equipment as Y2K ready.

Equipment	Test Result	If Fail, affected what?	Solution	Remark
01-NV	Fail	Fluke Controller	Rollback the Date	Can Roll back to 16 years (82)
02-NV	Fail	Fluke Controller	Rollback the Date	Can Roll back to 16 years (82)
03-NV	Fail	Fluke Controller	Rollback the Date	Can Roll back to 16 years (82)
04-NV	Fail	Fluke Controller	Rollback the Date	Can Roll back to 16 years (82)
05-NV	Fail	Fluke Controller	Rollback the Date	Can Roll back to 16 years (82)
06-NV	Fail	PC	Upgrade	Upgrade Available in Q3, 99
07-NV	Fail	Fluke Controller	Rollback the Date	Can Roll back to 16 years (82)
08-NV	Fail	PC	Upgrade	Upgrade Available in Q3, 99
01-PROM	Fail	PC	Rollback the Date	Can Roll back to 16 years (82)
01-WAVE	Passed	-	-	-
01-HEAT	NA	-	-	-

Table 4.12 : Implant Test Result Summary

Only newer equipment 06-NV and 08-NV that is model NV6200-AV, was not tested due to the system that tested was 06-NV has problem with software corruption and cannot change the date. Therefore, there is no test result for this model. The test result is the Supplier's test result. Although, this model has low impact to the problem is only at the display, input and Storage only. Implant module decide to upgrade the system due to the low cost of upgrade and this can fix the software corruption problem. The proposal to the Y2K Committee was approved afterward as well.

The table below is the actual Progress tracking of the Fab 1 under CSM against the projected progress. CSM using dynamic progress tracking. It means that every month, when the Y2K team review the progress so far, they will change the required progress for the following months to ensure the completion of the project is within time. In this case, the progress on Apr 9, 1999 is 87.1% for Fab 1 against the projected progress of 89%. Therefore, the next month the Y2K team need to increase the target of the following month to achieve the target.

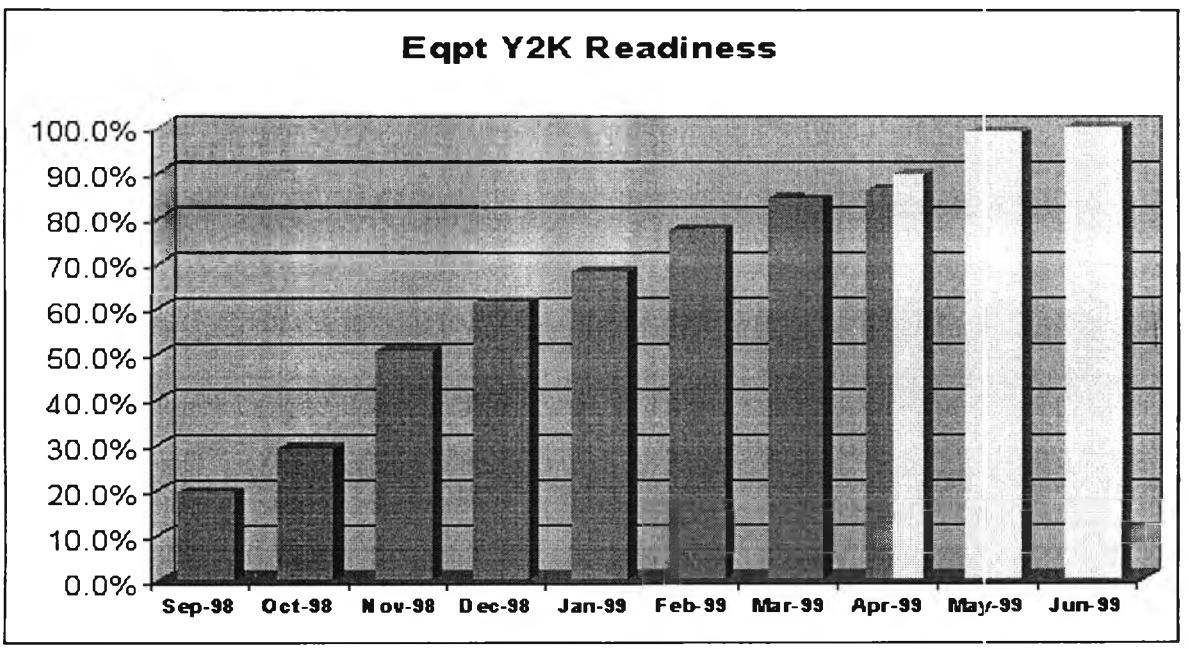


Figure 4.15 : Fab1Equipment Y2k Readiness - Status as of 9/4/1999

Table 4.13 : Fab1/2/3/SMP/Etest/QRA/Facilities
Equipment Y2k Readiness –Status as of 9/4/1999

Plant	Y2K Eqpt	Eqpt Total	% Readiness
Fab 1	291	334	87.1
Fab 2	380	471	80.7
Fab 3	165	192	86.4
SMP	92	101	91.1
Etest	51	51	100.0
Facilities	104	118	88.1
QRA	41	41	100.0

Equipment Y2k Readiness Forecast

	Sep 1998	Oct 1998	Nov 1998	Dec 1998	Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Apr 1999
% Ready	19.5%	29.1%	50.6%	61.3%	67.9%	77.3%	84.0%	86.0%	98.7%	100.0%	89.3%
% Ready	19.5%	29.1%	50.6%	61.3%	67.9%	77.3%	84.0%	89.3%	98.7%	100.0%	89.3%
Qty Ready	269	395	685	829	886	1011	1099	1124	1291	1308	1168
Total Qty	1379	1356	1354	1353	1305	1308	1308	1307	1308	1308	1308

Fab 1	Sep 1998	Oct 1998	Nov 1998	Dec 1998	Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Apr 1999
% Ready	19.8%	31.8%	73.6%	79.8%	80.8%	85.0%	86.8%	87.1%	98.5%	100.0%	88.0%
Qty Ready	75	122	281	304	270	284	290	291	329	334	294
Total Qty	379	384	382	381	334	334	334	334	334	334	334

Fab 2	Sep 1998	Oct 1998	Nov 1998	Dec 1998	Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Apr 1999
% Ready	5.0%	10.5%	29.7%	40.8%	49.8%	62.6%	76.6%	80.7%	98.9%	100.0%	83.0%
Qty Ready	25	50	141	194	236	295	361	380	466	471	391
Total Qty	503	475	475	475	474	471	471	471	471	471	471

Fab 3	Sep 1998	Oct 1998	Nov 1998	Dec 1998	Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Apr 1999
% Ready	15.1%	19.8%	29.2%	54.2%	71.4%	82.3%	84.4%	86.4%	100.0%	100.0%	97.4%
Qty Ready	29	38	56	104	137	158	162	165	192	192	187
Total Qty	192	192	192	192	192	192	192	191	192	192	192

SMP	Sep 1998	Oct 1998	Nov 1998	Dec 1998	Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Apr 1999
% Ready	44.6%	57.4%	66.3%	71.3%	81.2%	85.1%	91.1%	91.1%	99.0%	100.0%	93.1%
Qty Ready	45	58	67	72	82	86	92	92	100	101	94
Total Qty	101	101	101	101	101	101	101	101	101	101	101

Etest	Sep 1998	Oct 1998	Nov 1998	Dec 1998	Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Apr 1999
% Ready	8.9%	33.3%	35.6%	44.4%	51.1%	90.2%	100.0%	100.0%	100.0%	100.0%	100.0%
Qty Ready	4	15	16	20	23	46	51	51	51	51	51
Total Qty	45	45	45	45	45	51	51	51	51	51	51

Facilities	Sep 1998	Oct 1998	Nov 1998	Dec 1998	Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Apr 1999
% Ready	66.9%	71.2%	76.3%	82.2%	83.1%	85.6%	86.4%	88.1%	94.9%	100.0%	93.2%
Qty Ready	79	84	90	97	98	101	102	104	112	118	110
Total Qty	118	118	118	118	118	118	118	118	118	118	118

QRA	Sep 1998	Oct 1998	Nov 1998	Dec 1998	Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Apr 1999
% Ready	29.3%	68.3%	82.9%	92.7%	97.6%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Qty Ready	12	28	34	38	40	41	41	41	41	41	41
Total Qty	41	41	41	41	41	41	41	41	41	41	41

Table 4.14 : Fab1/2/3/SMP/Etest/QRA/Facilities
Equipment Y2k Readiness – Detail of History and Forecast Status as of 9/4/1999

Compare with the Master Plan, in the end of the first quarter of 1999 the project should be able to test all of the equipment. This mean that the equipment which indicated Y2K Compliant by Vendor would be able to classify as Y2K Ready. The equipment with 'Not Applicable' would automatically classify as Y2K Ready. For the equipment that is not Y2K Compliant and has low impact to the organization would consider as not Y2K Ready at this stage. However, due the decision from management to rollback the date (Sliding Window) of the equipment, which is part of the Correction phase. Therefore the progress at the end of the Implementation phase s more than initial planning. The initial planning progress of the project at the end of the first quarter of 1999 is base on testing all equipment only. Therefore the progress should be

% Progress = % of 'Yes' + % of 'NA'

Which % Progress should be equal to

= 12.7% + 50.2%

= 62.9%

But the actual progress is 87%

(Base on 'Yes' status is 12.1%, 'NA' status is 50.2%, the rest of the 24.7% are combination of 'Pending' status after Vendor Reply and 'No' Status with Date Rollback)

This is an alteration in plan made during testing phase to add some work of the Correction Phase into this phase. The more detail of the work done would be discuss in the next phase.

Correction and Recovery

As mention earlier, this phase would consist of 2 activities, Correction and Certification. At this phase The first activity that need to be done is the Certification of the equipment that Y2K team completed the test and known that it is Y2K Compliant. Therefore the certification would be the first activity. This can be done by documentation of the Y2K Compliant equipment in the database and also put the Status Tag onto the Machine to gain the awareness of the equipment user. This tag would use as the review criteria as well. With the tag on the machine itself, the auditor would be inform directly of

the equipment status of that machine. This Tag is not just use for the audit purpose only, CSM's customer may come to audit the Y2K status of CSM, by having organized system to determine the equipment status would gain the creditability of the organization.

The Audit Sheet below are the example of the audit sheet for the Purchase, IT and Operation Module.

Audit Checklist

Purchasing

Audit item :
Select vendors and verify the hardcopy of Y2K replies.

1) Vendor selected :		6) Vendor selected :	
Remarks :		Remarks :	
2) Vendor selected :		7) Vendor selected :	
Remarks :		Remarks :	
3) Vendor selected :		8) Vendor selected :	
Remarks :		Remarks :	
4) Vendor selected :		9) Vendor selected :	
Remarks :		Remarks :	
5) Vendor selected :		10) Vendor selected :	
Remarks :		Remarks :	

# of equipments audited =
# of issues =
% of conformance =

Audtior _____ (Name/Signature/Date)

Auditee _____ (Name/Signature/Date)

Figure 4.16 : Audit Checklist (Purchase)

Audit Checklist

I.T

1) Equipment selected : _____
(select from physical equipment)
Remarks :

3) Equipment selected : _____
(select from physical equipment)
Remarks :

2) Equipment selected : _____
(select from physical equipment)
Remarks :

4) Equipment selected : _____
(select from physical equipment)
Remarks :

5) Equipment selected : _____
(select from the Y2K test summary sheet)
Remarks :

7) Equipment selected : _____
(select from the Y2K test summary sheet)

6) Equipment selected : _____
(select from the Y2K test summary sheet)
Remarks :

8) Equipment selected : _____
(select from the Y2K test summary sheet)

Audit items :
1) Select min 4 equipments in the test area and audit its Y2K summary sheet & its Y2K tag.
2) Select and audit min 4 Y2K summary sheet and the equipment Y2K tag.

# of equipments audited =
# of issues =
% of conformance =

Auditor _____ (Name/Signature/Date)

Auditee _____ (Name/Signature/Date)

Figure 4.17 : Audit Checklist (IT)

Audit Checklist

All Fabs, QRA, Facilities, R&D. Audited Dept : _____

1) Equipment selected : _____
(select from physical equipment)
Remarks :

3) Equipment selected : _____
(select from physical equipment)
Remarks :

2) Equipment selected : _____
(select from physical equipment)
Remarks :

4) Equipment selected : _____
(select from physical equipment)
Remarks :

5) Equipment selected : _____
(select from the Y2K test summary sheet)
Remarks :

7) Equipment selected : _____
(select from the Y2K test summary sheet)

6) Equipment selected : _____
(select from the Y2K test summary sheet)
Remarks :

8) Equipment selected : _____
(select from the Y2K test summary sheet)

Audit items :
1) Select min 4 equipments in the test area and audit its Y2K summary sheet & its Y2K tag
2) Select and audit min 4 Y2K summary sheet and the equipment Y2K tag

# of equipments audited =
# of issues =
% of conformance =

Auditor _____ (Name/Signature/Date)

Auditee _____ (Name/Signature/Date)

Figure 4.18 : Audit Checklist (All Fabs, QRA, Facilities, R&D)

The Certification and Audit of the Equipment status can be done concurrently with the Correction of the equipment in the 'Not Y2K Compliant' category.

Correction activities in this phase are involve the some of the initial work done in the previous phase due to the change in plan by the top management to utilize the test result of the 'Not Y2K Compliant' and has low impact to rollback the date (Sliding Window). This would make the system to be Y2K ready. Therefore, the equipment in the 'Not Y2K Compliant' and need to be upgrade would reduce dramatically for Fab 1. For newer Fab, this would not be the case, since there are interaction and communication between systems. But Fab 1 majority equipment are stand alone system. Therefore, this solution is possible.

Before the upgrade, the Y2K team need to analyze the information of the equipment supplied by vendor and the experience in the past for the testing to do some precaution before the upgrade. As in the Risk analysis in Inventory assessment, the backup of the History Log, Recipes, Machine Parameters, Peripheral's Driver, Application and OS is necessary. Any bug during the upgrade can cause the unnecessary down time to the production equipment would cause loss in profit margin of the organization. After the upgrade, the equipment need to be tested again to ensure the upgrade meet the CSM standard.

In Fab 1, the rest of the equipment that need to upgrade would be done in this phase when the solution is available. This is because of the Y2K Service Provider cannot manage the solution to CSM within timeline that Y2K team expected. The table below is the summary of the equipment as of Jun 1999.

Plant	Y2K Eqpt	Eqpt Total	% Readiness
Fab 1	330	334	98.8
Fab 2	460	471	97.7
Fab 3	187	191	97.9
SMP	104	104	100.0
Etest	51	51	100.0
Facilities	116	118	948.3
QRA	41	41	100.0
Total	1289	1310	98.4

Table 4.13 : Equipment Status as at Jun 1999.

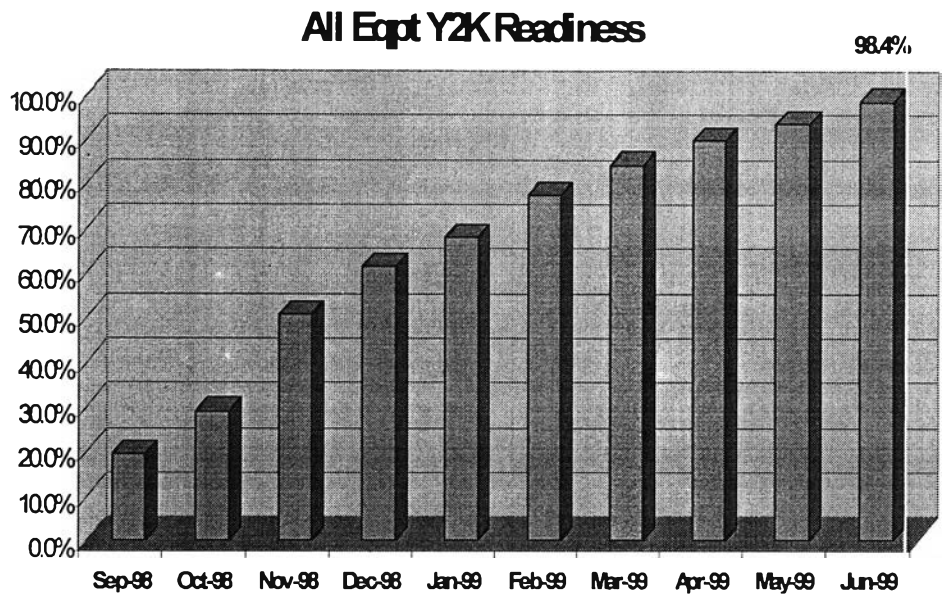


Figure 4.19 : Equipment Status as at Jun 1999.

From the progress chart, the progress is not 100% at the end of the second quarter. According to the initial plan the project should completed and ready for the Millennium crossover by the end of the third quarter. However, finishing everything in advance is necessary to ensure there are some time buffer for Y2K to handle the Contingency Plan for the Crossover. By planning the progress to end at the end of the second quarter, this would serve as a triggering point for the team member to aware of the potential cause of the delaying the project. Keep in mind that only one critical equipment that is not Y2K compliant might cause the whole system to affect by the year 2000 crisis.

At this stage, the inventory of the equipment that having problem is necessary to gain the attention for all organization levels. The history of all other equipment would be left aside. The Y2K need to keep closer look for the equipment that would have the upgrade late or not ready before the Millennium. These equipment may need an involvement from the top management to deal directly to the Y2K Service Provider for the progress. It is the fact that the communication between the operation level may not have any progress if the top management policy is not support the decision. Therefore,

let the management dealing together directly at the policy level would help to process the solution faster.

Summary :

Total Remaining Equipment to 100% Y2K Readiness (30 June 1999) = 33 (2.5 %)

Total Remaining Equipment may skip deadline = 15 (1.15 %)

	Total remaining Eqpt	No. that may skip deadline
Fab 1	6	**6**
Fab 2	16	**6**
Fab 3	4	**1**
SMP	1	**0**
Facility	6	**2**
Total	**33**	**15**
	2.52%	1.15%

Total Remaining Equipment that may skip deadline = 15 (1.15%)

S/No	Fab	Vendor	Item	Planned Test Date	Solutions Planned	Solution Available	Comments
1	Fab1-Etch	Applied Material	Metal Etcher AMT8330	Wk27			Id:02-AMT83; Encounter bugs (non-Y2K) during upgrade. Retest onWk27.
2	Fab1-Implant	Eaton	Med. Cur. Impr NV-6200				Id:06-NV ; s/w ready - planning for m/c time
3	Fab1-Implant	Eaton	Med. Cur. Impr NV-6200				Id:08-NV ; s/w ready - planning for m/c time
4	Fab1-Yield	Image Transform	Defect Review Station EX500L				Id:01-REVIE ; Pending for solution
5	Fab1-Yield	Image Transform	Inspex m/c TPC8510				Id:01-INSPE & 02-INSPE ; After upgrade, cannot access analysis mode.
6	Fab1-Thin Film	Novellus	Concept One C1-150D	Wk27			Id:1-Nov : Plan to test on Wk27
7-8	Fab2-Diffision		Group Controller	07/15/99			2 pending upgrade (s/w just released). Vendor asking S$60K fee
9	Fab2-Litho						1 Workstation pending testing
10-11	Fab2-Etch	AMAT	Centura	07/08/99			2 tested Y2K BUT no TEMP INTERLOCK. New Beta rel ext to 31/7
12-13	Fab2-Implant	AMAT	HCIMP	07/15/99			2 new s/w buggy. New version rel committed 26/5 but ext to 30/6
14	Fab3-Litho	KLA-Tencor	Mask Overlay Mt 5200	by 31-Jul			Id:OVLY-AM1 : New System upgrade in June, testing in July.
15	Fab2-Facilities	Soxal	Safety Simon Monitoring	07/31/99			PO:B-800203 (late)
16	Fab2-Facilities	SemiTech (S) P L	UPW 30K Scada	07/31/99			PO:B-400789 (late)

Details :

Fab : FAB1 **Remaining Eqpt =** 6

S/No	Dept	Vendor	Item	Planned Test Date	Solutions Planned	Solution Available	Comments
1	Etch	Applied Material	Metal Etcher AMT8330	Wk27			Id:02-AMT83; Encounter bugs (non-Y2K) during upgrade. Retest again.
2	Implant	Eaton	Medium Current Implanter NV-6200				Id:06-NV ; s/w ready - planning for m/c time
3	Implant	Eaton	Medium Current Implanter NV-6200				Id:08-NV ; s/w ready - planning for m/c time
4	Yield	Image Transform	Defect Review Station EX500L				Id:01-REVIE ; Pending for solution
5	Yield	Image Transform	Inspex m/c TPC8510				Id:01-INSPE & 02-INSPE ; After upgrade, cannot access analysis mode.
6	Thin Film	Novellus	Concept One C1-150D	Wk27			Id:1-Nov : Plan to test on Wk27

Fab : FAB2 **Remaining** 16

S/No	Dept	Vendor	Item	Planned Test Date	Solutions Planned	Solution Available	Comments
1	Diffision		Group Controller	07/15/99			2 pending upgrade (s/w just released). Vendor asking S$60K fee
2	Implant	Eaton	HCIMP	06/21/99			7 Y2K s/w ready but suspect bug causing wafer chipping
3	Litho		KLA5100	06/08/99			1 pending testing
4	Litho						1 Workstation pending testing
5	Etch		PROF-01	06/15/99			1 Pending for vendor verification
6	Etch	AMAT	Centura	08/07/99			2 tested Y2K BUT no TEMP INTERLOCK. New Beta rel ext to 31/7
7	Implant	AMAT	HCIMP	07/15/99			2 new s/w buggy. New version rel committed 26/5 but ext to 30/6

Fab : FAB3 **Remaining** 4

S/No	Dept	Vendor	Item	Planned Test Date	Solutions Planned	Solution Available	Comments
1	Litho	KLA-Tencor	Mask Overlay Mt 5200	by 31-Jul			Id:OVLY-AM1 : New System upgrade in June, testing in July.
2	Diffusion	Lumonics	Laser Marker SigmaClean				Id:LASE-A01: Recipe migration to SMP first as backup. Testing by 29/6 or 1st wk July
3	Implant	Varian	Medium Current Implanter EHP500				Id:MIMP-A01: Currently testing in SMP, if Ok then test at Fab3
4	Implant	Varian	Medium Current Implanter EHP500				Id:MIMP-A03: Currently testing in SMP, if Ok then test at Fab3

Fab : SMP **Remaining** 1

S/No	Dept	Vendor	Item	Planned Test Date	Solutions Planned	Solution Available	Comments
1	Implant	Varian	Medium Current Implanter	02/28/99	04/15/99		Whole package is going to arrive on May

FACILITIES **Remaining** 6

S/No	Dept	Vendor	Item	Planned Test Date	Solutions Planned	Solution Available	Comments
1	Fab 3		Chemcial CDM 1500	06/15/99			In Progress
2	Fab 3		Chemical Barcode System	06/18/99			Pending
3	Fab 3		Chemical Slurry System	06/17/99			Pending
4	Fab 2	Soxal	Safety Simon Monitoring	07/31/99			PO:B-800203 (late)
5	Fab 2		Chemical ChemLitho	06/30/99			In Progress
6	Fab 2	SemiTech (S) P L	UPW 30K Scada	06/30/99			PO:B-400789 (late)

Table 4.16 : Equipment that may Skip Deadline Summary

From the Summary of the equipment in the database, one observation can be made, the equipment in the older Fab (Fab 1) has the highest number of equipment that might skip the deadline. As mention earlier, the Y2K Service vendor tendency to serve the potential customer would be their first priority or the older equipment has lower quantity, hence result in lower priority. In this case the newer Fab might take their Y2K Service into their consideration for future purchase. This would left the older fab to be last in their priority list.

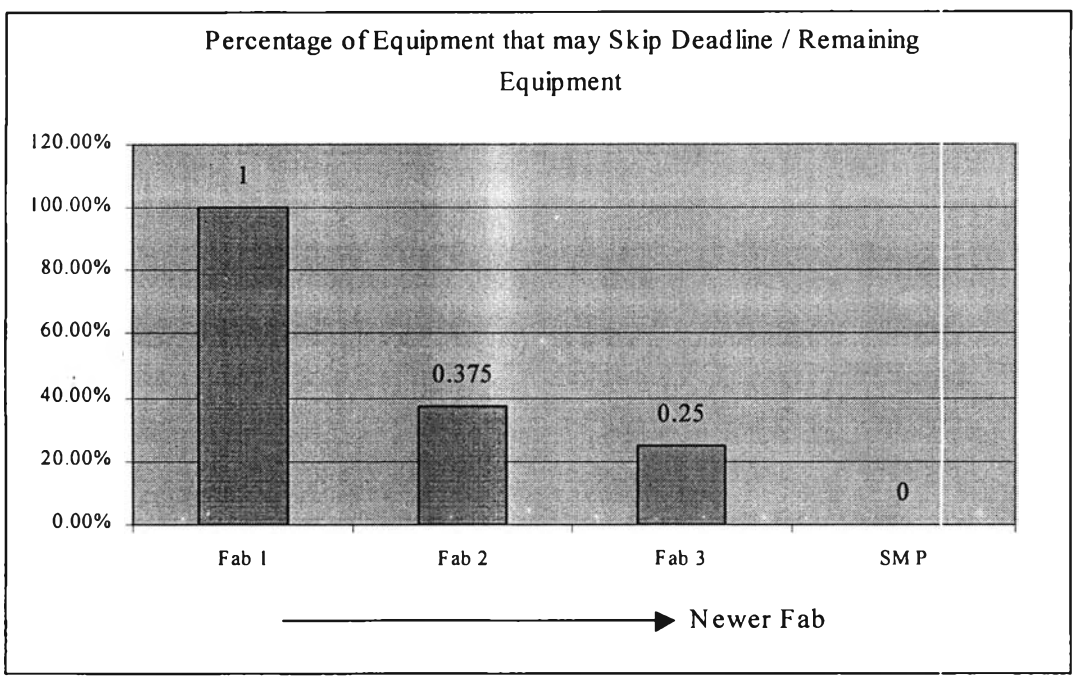


Figure 4.20 Relationship of Delayed Equipment and Fab chronological order

With the problematic equipment, the Y2K team need to get the commitment from the Y2K Service Provider through the Management support.

Implant module has contribute two equipment 06-NV and 08-NV for Fab1, which is the same equipment model NV6200-AV. The upgrade is necessary to ensure the PC is Y2K Compliant. There are few upgrade need to be done:

1. BIOS Upgrade for both Systems.

2. Software Upgrade for both Systems.
3. CPU Upgrade for 06-NV (Current CPU is 386).

In Implant Module's case, the upgrade kit is ready at the end of June. However, due to the problem of quality in the earlier of June cause the production WIP to pile up until the end of June in the implant area and all of the WIP need to clear as soon as possible. This make the upgrade is impossible to execute in this time frame. As mentioned in the Business Impact Analysis, the On-time shipment is necessary to ensure the product price in the future. The upgrade itself is required 8 hours to complete the upgrade. The testing need another 6 hours in case of everything is going smooth. If there is any problem occur during the testing and need to be fix, it would take much longer time. Therefore, the upgrade is delay until August.

After the management involve in the negotiation with the Y2K Service Provider and assess the internal situation, the response from Y2K Service Provider and progress is rapid. As can see from the tracking table below.

Summary :

Total Remaining Equipment :		Percentage
2-Jul-1999 (Fri)	**21**	**1.6%**
6-Jul-1999 (Tue)	**13**	**1.0%**

	Remaining Eqpt **2 Jul 1999**	Remaining Eqpt 6 **Jul 1999**	Remaining Eqpt **Jul 1999**	16
Fab 1	4	**4**		
Fab 2	11	**6**		
Fab 3	4	**1**		
SMP	0	**0**		
Facility	2	**2**		
Total	**21**	**13**		
	1.60%	0.99%		

Table 4.17: Delayed Equipment Status after Management Involvement

From this table it is quite obvious that the progress is rapid after the management involvement. As the time that end of this phase deadline (End of Third Quarter), the

equipment is still not 100% ready for the Millennium Crossover. This is due the Y2K service supplier having some problem deliver the upgrade kit to CSM (more detail is in Appendix E). Eventually this equipment was completed and ready for the Crossover at the end of October 1999.