# **Appendices**

#### Appendix A: Pack and Label Process Flow Chart - Present Method

Appendix A1: Present Method - Observation 1

Flow process	chart - Ol	servtio	on 1						
Chart No. 1 Sheet No. 1 of 1 Summary									
Subject charted:	Activity		Pres	ent			ose		Saving
Pack and Label	Operation	1 0	11		<u> </u>				
FACK and Laber	Transport		1	- 1				- 1	
Activity:	Delay		5						
Labeling, sealing, inspection, straping &	Inspectio	n 🗐	8	- 1					
	Storage	'' \\	1					- 1	
packing	Distance	v	<u>'</u>					-	
Method: Present		<u>`                                    </u>							
Location: Packing Area	Time (wo	rk-n)		-				-	
Operative(s):	Cost		_						
C shift	Labour 0 Material		5						
Prepared by: YH Chia Date:20Dec2000									-
	Total			$\vdash$					
	1	Ave-							
		rage	Time						
Description	Quantity	(min/	(min)	_					
		unit)	<u> </u>	P			ymb		Remarks
								V	
				<u> </u>			_		
Print and paste labels on bags & boxes		45	15	<u>X</u>					
Bags sent to QA and wait for audit	1	15		<u> </u>		×			
QA check s/order and count the no. of bags	48	0.104			_		×		
QA program the Telxon portable scanner	1	3		<b>*</b> <	$\sqrt{}$	_	_		
QA scan bar code labels 100%	48	0.208					<b>&gt;X</b>	_	
QA stamp on all bags' labels	48	0.271	13	×		_			
Wait for bag sealing						<b>≫</b>			
Arrange/strap tube/trays per requirement				X					
Vacuum seal bags and place in boxes				<b>X</b>					
Wait for QA Drypack audit	1	25	25			X			
QA check dry pack quality	150	0.067	10				<b>×</b>		
Program Telxon portable scanner	1	3		<b>*</b>					
Scan box labels 100%	150	0.067	10				*		
QA check bag labels vs. box labels	150	0.067	10				<b>X</b>		
QA stamp on all the boxes' labels	150	0.027	4	*					
QA goto terminal and End lot at Genesis	1	6	6	<b>*</b>					
Seal boxes and strap				<b>*</b>					
Goto terminal and print DSF				*					
Stage for QA final audit	1	30	30	$\Box$		X			
QA pick up the DSF and verify lot numbers	1	12					X		
Count number of boxes on the trolley	85	0.047		Т	Π		1 *		
Check for QA Stamp on the box label	85	0.047	7 4				X	Г	
QA stamp on the DSF	1	1		X<		1			
Wait for transport to warehouse			1	1		X		1	
Push lot to drop ship		1	1		×		1	1	
Staged for orders at drop ship		1	1		1	$\Box$		×	
		T	1	1	T	T	T		
	1	1	<del>                                     </del>	†	1	T	1	1	
	1	<b>†</b>	T	T	T	$\top$	$\top$	T	
				T	T	1	1	1	
	+	†		11	1	5	8	1	<b>†</b>
				1					-

# Appendix A2: Present Method - Observation 2

Flow process of	hart - Ob	servati	on 2						
Chart No. 2 Sheet No. 1 of 1	Summary								
Subject charted:	Activity		Pres	ent			osec		Saving
Pack and Label	Operation	n ()	11						
	Transport	~ 1	1	- 1					
Activity:	Delay	금	5						
Labeling, sealing, inspection, straping &	Inspectio	n 🗐	8	- 1			- 1		
packing	Storage	4	1	- 1				- 1	
Method: Present	Distance			$\neg$					
Location: Packing Area	Time (wo	, ,		$\neg$		-		$\neg$	
Operative(s):	Cost	117		$\dashv$				$\dashv$	
l · · · · · · · · · · · · · · · · · · ·	0031	Labour	5					- 1	
C shift Prepared by: YH Chia Date:20Dec2000	<b>→</b>		]					- 1	
Prepared by: YH Chia Date.200e02000	Total	viateriai							
	Total		<del>                                     </del>						
	1	Ave-							
December 1	O matitud	rage	Time						
Description	Quantity	(min/	(min)	_					D
		unit)	· '		oces				Remarks
		,		()				V	
			_		-	-			
Print and paste labels on bags & boxes				Х.	_		$\dashv$		
Bags sent to QA and wait for audit	1	10	_			×			
QA check s/order and count the no. of bags	15	0.133	_		_		×		
QA program the Telxon portable scanner	1	3		Ж	$\leq$				
QA scan bar code labels 100%	15	0.533				=	*		
QA stamp on all bags' labels	15	0.267	4	X⊲					
Wait for bag sealing					_	❈			
Arrange/strap tube/trays per requirement				X					
Vacuum seal bags and place in boxes				<u>X</u>					
Wait for QA Drypack audit	1	15	15			X			
QA check dry pack quality	100	0.15	15				<b>X</b>		
Program Telxon portable scanner	1	3	3	×					
Scan box labels 100%	100	0.13	13				<b>*</b>		
QA check bag labels vs. box labels	100	0.1	10				*		
QA stamp on all the boxes' labels	100	0.05	5	*					
QA goto terminal and End lot at Genesis	1	6	6	*					
Seal boxes and strap				*					
Goto terminal and print DSF				X	_				
Stage for QA final audit	1	18	18			×			
QA pick up the DSF and verify lot numbers	1	8					X		
Count number of boxes on the trolley	56	0.179	10				*		
Check for QA Stamp on the box label	56	0.089					X		
QA stamp on the DSF	1	1	-	X<					
Wait for transport to warehouse			1			×			
Push lot to drop ship	1		1	T	×				
Staged for orders at drop ship	1	<del>                                     </del>	T	$\vdash$		_		×	
Staged for Gradis at Grop Ship		<del>                                     </del>	1	1-			$\vdash$	1	
	+	<del> </del>	+	$\vdash$	$\vdash$	_		1	
	+	<del> </del>	+	+	-	-	+-		
	+	<del>                                     </del>	+	+	-		+	$\vdash$	
	1	<del> </del>	+	11	1	5	8	1	
				1''	<u> </u>	Ļ	1 0	<del>'</del>	

#### Appendix B: Questioning Techniques applied to the activities

Appendix B1: QA program the TELXON portable scanner

Activity		Primary & Secondary Questions	Answers
2. QA program the	Purpose	What is done?	Scan the bar coded lot number and target device from the Shop Order, key in the lot size and date code.
TELXON portable scanner		Why is it done?	To program the correct information to the TELXON scanner for counterchecking the bar code labels pasted on box or bags.
		What else might be done?	Manually memorise the lot number, target device, quantity and date code.
		What should be done?	An accurate and easy method of checking the integrity of the bar code labels.
	Place	Where is it done?	At the QA OFI gate station
		Why is it done there?	The bags are sent there for QA buy- off
		Where else might it be done?	At the trolley where the materials are staged
		Where should it be done?	At the place most convenient to the QAs or minimum material/people movement
	Sequence	When is it done?	After labels has been pasted on bags but before materials are placed in the bags
		Why is it done then?	More convenient to check empty bags
		When might it be done?	When the pack and label is completed
		When should it be done?	After all the pack and label processes are completed
	Person	Who does it?	QA specialists
		Why does that person do it?	As an independent party to ensure proper processes is done
		Who else might do it?	Production operators
		Who should do it?	Both QA and production
	Means	How is it done?	Scan the bar coded lot number and target device from the Shop Order, key in the lot size and date code.
		Why is it done that way?	Limited by the TELXON capability of scanning one bar code at a time and the unavailability of bar coded date code and quantity.
		How else might it be done?	Online with the CIM and able to download information of the lot to the scanner by scanning the lot number only.
		How should it be done?	Which ever way is currently affordable.

Appendix B2: QA scan bar code labels 100%

Activity		Primary & Secondary Questions	Answers
3. QA scan bar code labels	Purpose	What is done?	Each of the 4 bar codes in each label is scanned using the TELXON programmed earlier.
100%		Why is it done?	To capture the bar code information into the TELXON and compare it with what was programmed earlier
		What else might be done?	Manually check based on human eye inspection.
		What should be done?	An accurate method of checking the integrity of the bar code labels.
	Place	Where is it done?	At the QA OFI gate station
		Why is it done there?	The bags are sent there for QA buy- off
		Where else might it be done?	At the trolley where the materials are staged
		Where should it be done?	At the place most convenient to the QAs and with minimum material/people movement
	Sequence	When is it done?	After labels has been pasted on bags but before materials are placed in the bags
		Why is it done then?	More convenient to check empty bags
		When might it be done?	When the pack and label is completed
		When should it be done?	After all the pack and label processes are completed
	Person	Who does it?	QA specialists
		Why does that person do it?	As an independent party to ensure proper processes is done
		Who else might do it?	Production operators
		Who should do it?	Both QA and production
	Means	How is it done?	Scanning all the bar codes on each label
		Why is it done that way?	Limited by the TELXON capability of scanning one bar code at a time.
		How else might it be done?	Vision capturing all 4 bar codes at the same time
		How should it be done?	A faster vision system capable of verifying all the bar codes in the label.

#### Appendix B3: QA stamp on all bags' labels

Activity		Primary & Secondary Questions	Answers
4. QA stamp on	Purpose	What is done?	Placing a QA stamp on all bar code labels verified by QA
all bags' labels		Why is it done?	To indicate that the labels has been bought off by the QA specialists
		What else might be done?	None
_		What should be done?	Stamp may not be needed
	Place	Where is it done?	At the QA OFI gate station
		Why is it done there?	The bags are sent there for QA buy- off
		Where else might it be done?	At the trolley where the materials are staged
		Where should it be done?	At the place most convenient to the QAs and with minimum material/people movement
	Sequence	When is it done?	After labels has been pasted on bags but before materials are placed in the bags
		Why is it done then?	More convenient to stamp on empty bags
		When might it be done?	When the pack and label is completed
		When should it be done?	After all the pack and label processes are completed
1 1 1	Person	Who does it?	QA specialists
		Why does that person do it?	As an independent party to ensure proper processes is done
		Who else might do it?	Nobody
		Who should do it?	Nobody
	Means	How is it done?	By placing the controlled QA stamp onto the right side of the labels without obstructing the information on the label.
	1	Why is it done that way?	To avoid smearing the information,
		How else might it be done?	Not necessary
		How should it be done?	Not necessary

# Appendix B4: QA check dry pack quality

Activity		Primary & Secondary	Answers
		Questions	
5. QA	Purpose	What is done?	Each dry pack bags is checked for
check dry		1	sealing quality.
pack		Why is it done?	To ensure there is no leakage in the
quality		- J.	bag
		What else might be done?	Process monitor of sealing quality
		What should be done?	Random audit by QA instead of 100%
	Piace	Where is it done?	At the trolley bay where the materials
			are staged.
		Why is it done there?	The bags are staged there after
	100		sealing waiting for QA audit and box
			label buy-off.
		Where else might it be done?	At the QA station
		Where should it be done?	At the place most convenient to the
1.5			QAs and with minimum
			material/people movement
	Sequence	When is it done?	After bags are sealed
		Why is it done then?	Immediate step after bags are sealed
1.			just before boxes are sealed.
	,	When might it be done?	Any time after sealing
1		When should it be done?	After bag sealing but before box
ļ			sealing
	Person	Who does it?	QA specialists
100		Why does that person do it?	As an independent party to ensure
			proper processes is done
		Who else might do it?	Production operators
		Who should do it?	Both QA and production
	Means	How is it done?	Pick up each bag and visually look for
			any leakage and also randomly pull
			the sealing imprint on some bags.
		Why is it done that way?	Most effective way to check for
			sealing integrity.
		How else might it be done?	No other way
		How should it be done?	On a sampling basis by QA
			Specialists and every bags by
			production operators.

#### Appendix B5: QA check bag labels vs. box labels

Activity		Primary & Secondary Questions	Answers
6. QA check bag	Purpose	What is done?	Compare the bag labels with box labels for each container
labels vs. box labels		Why is it done?	To ensure the right bags are placed in the right boxes
		What else might be done?	NA
		What should be done?	Random audit by QA instead of 100%
	Place	Where is it done?	At the trolley bay where the materials are staged.
		Why is it done there?	It is done at the same time with dry pack audit.
,		Where else might it be done?	At the QA station
		Where should it be done?	At the place most convenient to the QAs and with minimum material/people movement
a selection of	Sequence	When is it done?	After bags are placed in the box
		Why is it done then?	To allow comparison of bags and box labels after production have completed the packing.
		When might it be done?	Any time after production has finished their packing of bags in the boxes
	***	When should it be done?	After bags are placed in the box but before box sealing
	Person	Who does it?	QA specialists
		Why does that person do it?	As an independent party to ensure proper processes is done
		Who else might do it?	Production operators
		Who should do it?	Both QA and production
	Means	How is it done?	Pick up each bags and visually compare the labels on the bags with the boxes. Usually the lot number is used as reference.
		Why is it done that way?	Most efficient way to compare labels.
		How else might it be done?	No other way
		How should it be done?	On a sampling basis by QA Specialists and every bags by production operators.

#### Appendix B6: QA DSF Audit

Activity		Primary & Secondary Questions	Answers
7. QA DSF Audit	Purpose	What is done?	Every Daily Shipment Form (DSF) are being audited.
		Why is it done?	To ensure the correct number of boxes are placed on the trolley and lot number on DSF matches with actual lot on trolley
		What else might be done?	NA
		What should be done?	NA
	Place	Where is it done?	At the trolley bay where the materials are staged.
		Why is it done there?	The materials are staged there after the DSF is printed.
		Where else might it be done?	NA
		Where should it be done?	NA
	Sequence	When is it done?	After DSF is printed and attached to the lot.
		Why is it done then?	DSF is not printable before the QA Packing Audit event are completed.
		When might it be done?	NA
		When should it be done?	NA
	Person	Who does it?	QA specialists
		Why does that person do it?	As an independent party to ensure proper processes is done
		Who else might do it?	Production operators
		Who should do it?	Both QA and production
	Means	How is it done?	Pick up the DSF and compare the
			information printed with the box quantity and lot numbers.
		Why is it done that way?	NA
		How else might it be done?	NA
		How should it be done?	NA

#### Appendix C: Pack and Label Process Flow Chart - Proposed Method

Appendix C1: Proposed Method - Observation 1

Flow process	chart - Ol	servati	on 1						
Chart No. 1 Sheet No. 1 of 1						Sun	ıma	ry	
Subject charted:	Activity		Pres	ent		rop	ose	d	Saving
Pack and Label	Operation	n ()	11		10				
	Transpor	t 📄	1				1		
Activity:	Delay	$\Box$	5		4				
Labeling, sealing, inspection, straping &	Inspection	n 🗐	8				7		
packing	Storage	$\overline{\nabla}$	1				1		
Method: Proposed	Distance	(m)							
Location: Packing Area	Time (wo	rk-h)							
Operative(s):	Cost	,							
C shift		Labour	5						
Prepared by: YH Chia Date:03Jan2001	1 1	Material	-						
, ,	Total								
		Ave-							
		rane	Time						
Description	Quantity	(min/	(min)						
		unit)	P		roce	cess Symbol			Remarks
		uriit)		$\bigcirc$					
				,,		_		_	
Print and paste labels on bags & boxes				Ж.	$\mathcal{A}$		├	├	
Wait for bag sealing				1	_	<u>×</u>	-	⊢	
Arrange/strap tube/trays per requirement				X			-	├	
Vacuum seal bags and place in boxes		10	10	*	_		├	├	
Wait for QA Drypack audit	1	10		_		×	L.,	├	
QA check S/Order and dry pack quality	120	0.108	_			_	<b>*</b>	├	
Program Telxon portable scanner for bag labels	1	5	_	*	/	_	<u></u>	_	
Scan bag labels 100%	120	0.125			_	_	*	-	
Re-Program Telxon portable scanner for box	1	3	3	<b>X</b> <			ļ	├—	
Scan box labels 100%	80	0.125				_	1	├	
QA check bag labels vs. box labels	80	0.138		<u> </u>	_	_	×	┞—	
QA stamp on all the boxes' labels	80	0.075		*		_	├	├	
QA goto terminal and End lot at Genesis	1	5	5	X	_		├	-	
Seal boxes and strap				*			ļ	-	
Goto terminal and print DSF				*	_	,,,	_	-	
Stage for QA final audit	1	25				X	<u></u>	<u> </u>	
QA pick up the DSF and verify lot numbers	1	12				_	¥	<u> </u>	
Count number of boxes on the trolley	44	0.114		_	_	_	<u>X</u>	_	
Check for QA Stamp on the box label	44	0.136			_	_	<del>  X</del>	_	
QA stamp on the DSF	1	3	3	<b>X</b> <	_			-	
Wait for transport to warehouse				_	ر. ا	<u>*</u>	_	-	
Push lot to drop ship				-	×		_	<u></u>	
Staged for orders at drop ship		-	-	-		<u> </u>		×	
	<del> </del>		_	-	-	-	-	-	
			-	-	-		├	-	<del> </del>
						-		$\vdash$	<del>                                     </del>
Total	<b> </b>	-		10	1	4	7	1	<del>                                     </del>
Total		L			<u> </u>		L	<u> </u>	L

# Appendix C2: Proposed Method - Observation 2

Chart No. 2 Sheet No. 1 of 1	chart - Ob					Sum	mai	v	
Subject charted:	Activity		Prese	nt		rop		Saving	
Pack and Label	Activity Operation		11	3111		тор	10	4	Saving
Pack and Laber	Transport	~	1				1		
Activity	Delay	呂	5				- 1		
Activity:  Labeling, sealing, inspection, straping &	Inspection		8				4 7		
	Storage	1				1			
packing Method: Proposed	Distance	(m)	<del>- '</del> -	-			<u> </u>	-	
Location: Packing Area	Time (wo	<u> </u>							
Operative(s):	Cost								
C shift	Cost	Labour	5						
Prepared by: YH Chia Date:03Jan2001	1 ,	//aterial	1						
Prepared by: 111 Chia Date:000ah2001	Total	viateriai							
		Ave-							
		rage	Time						
Description	Quantity	(min/	(min)						
		unit)	(111111)		ocess Symbol				Remarks
		unit		$\bigcirc$				$\nabla$	
					Ĺ		_		
Print and paste labels on bags & boxes				<b>X</b>	_		_		
Wait for bag sealing						*		_	
Arrange/strap tube/trays per requirement				×				_	
Vacuum seal bags and place in boxes				Х.	_				
Wait for QA Drypack audit	1	15			_	×	ļ.,		
QA check S/Order and dry pack quality	78	0.128		1/	_	_	<b>*</b>	<u> </u>	
Program Telxon portable scanner for bag labels	1 1	5		×		_		<u> </u>	
Scan bag labels 100%	78	0.154					<b>&gt;</b> ×	_	
Re-Program Telxon portable scanner for box	1	3		<b>X</b> <			1,,	_	
Scan box labels 100%	78	0.192			<u> </u>		*		
QA check bag labels vs. box labels	78	0.103				_	1	-	
QA stamp on all the boxes' labels	78	0.064		X			├	├	
QA goto terminal and End lot at Genesis	1	5	5	*	_	_	<u> </u>		
Seal boxes and strap	<u> </u>		-	1		_	├	⊢	
Goto terminal and print DSF			-	*	<b>-</b>	L.	-	├-	
Stage for QA final audit	1	5		-	-	X	<b>—</b>	-	
QA pick up the DSF and verify lot numbers	. 1	7				-	1	-	
Count number of boxes on the trolley	20	0.25		-	-		₩	-	
Check for QA Stamp on the box label	20	0.15		- V	_	-	<b>*</b>	-	
QA stamp on the DSF	1	3	3	<b>X</b> <	-	-	$\vdash$	-	
Wait for transport to warehouse	-		-	-	1	×	+-	$\vdash$	
Push lot to drop ship	-		-	-	×		-	×	
Staged for orders at drop ship		-		-	-	+	-	<del> ^</del>	
	-	-	-	┼	┼	+-	+	╁	
			+	-	-	+-	+	$\vdash$	
	-	<del>                                     </del>	+	+-	+	+	+	$\vdash$	
Total			-	10	1	4	7	1	-

# Appendix C3: Proposed Method - Observation 3

Flow process	chart - Ob	servati	on 3						
Chart No. 3 Sheet No. 1 of 1						Sum	mai	ry	
Subject charted:	Activity		Pres	ent			ose		Saving
Pack and Label	Operation	1 (	11	$\neg$	_	10			
	Transport	~	1	- 1			1		
Activity:	Delay	금	5	- 1	4				
Labeling, sealing, inspection, straping &	Inspectio	n 🗐	8	- 1			7		
packing	Storage	$\nabla$	1	- 1			1		
Method: Proposed	Distance			$\neg$					
Location: Packing Area	Time (work-h)			一					
Operative(s):	Cost								
B shift		Labour	5						
Prepared by: YH Chia Date:04Jan2001	t 1	//aterial							
l access to the contract of th	Total								
		Ave-							
		rage	Time						
Description	Quantity	(min/	(min)	_		_			
		unit)	) / P		rocess Sym				Remarks
		,		()	7		Ш	V	
Print and paste labels on bags & boxes				X		_		-	
Wait for bag sealing	-		$\vdash$	1	~	×	-	$\vdash$	
Arrange/strap tube/trays per requirement				*	_	^	$\vdash$	_	
Vacuum seal bags and place in boxes	-			1		$\vdash$	-		
Wait for QA Drypack audit	1	45	45	~	_	X	-	-	
QA check S/Order and dry pack quality	190	0.116		-		<del>  ^</del>	Ж		
Program Telxon portable scanner for bag labels	1	5		*		_		$\vdash$	
Scan bag labels 100%	190	0.158		L^	_	-	×	-	
Re-Program Telxon portable scanner for box	1	3		×			<del>                                     </del>	<del>                                     </del>	
Scan box labels 100%	190	0.121	_		_		×		
QA check bag labels vs. box labels	190	0.079		-		_	1	$\vdash$	
QA stamp on all the boxes' labels	190	0.053		*	_		<del>  ^</del>	$\vdash$	
QA goto terminal and End lot at Genesis	1	8		Ŧ		$\vdash$	<del>                                     </del>	$\vdash$	
Seal boxes and strap		<del>.</del>	<u> </u>	1	-		$\vdash$	$\vdash$	
Goto terminal and print DSF			_	1		$\vdash$	<del>                                     </del>	<b>†</b>	
Stage for QA final audit	1	20	20	T	~	X	<u> </u>	$\vdash$	
QA pick up the DSF and verify lot numbers	1 1	10		$\vdash$	_		×	_	
Count number of boxes on the trolley	44	0.182		<b>—</b>		T	<b>X</b>	Т	
Check for QA Stamp on the box label	44	0.114		<b>†</b>			*	$\vdash$	
QA stamp on the DSF	1	3		X				$\vdash$	
Wait for transport to warehouse	1				-	×	1		
Push lot to drop ship	1			<b>T</b>	X		<del>                                     </del>	$\vdash$	
Staged for orders at drop ship			<b>T</b>	1				×	
				<u> </u>		$\vdash$	T		
				T		1	T	1	
				T		Τ	T	T	
				T					
Total				10	1	4	7	1	1

Appendix C4: Proposed Method - Observation 4

Flow process	chart - Ob	servati	on 4						
Chart No. 4 Sheet No. 1 of 1					- 5	Sum	mar	y	
Subject charted:	Activity		Pres	ent	P	rop	oseo	t	Saving
Pack and Label	Operation		11		10				
	Transport		1				1	١	
Activity:	Delay	ᇙ	5				4		
Labeling, sealing, inspection, straping &	Inspectio	n 🗂	8				7		
packing	Storage	$\Delta$	1				1		
Method: Proposed	Distance		<u> </u>						
Location: Packing Area	Time (wo		_						
Operative(s):	Cost			_	_				
B shift	0031	Labour	5						
Prepared by: YH Chia Date:04Jan2001	1 ,	//aterial	١						
Date:043an2001	Total	viateriai		_					
	Total								
		Ave-							
Description	Quantity	rage	Time						
Description	Quality	(min/	(min)	Б.		aa C	Symb	201	Remarks
		unit)					y I I I		nemarks
	-			C	1		1	V.	
Print and paste labels on bags & boxes				<b>X</b>				-	
Wait for bag sealing					_	×			
Arrange/strap tube/trays per requirement	-			×		_	$\vdash$	$\vdash$	
Vacuum seal bags and place in boxes	-	-		1				├─	
Wait for QA Drypack audit	1	5	5	~	_	X	$\vdash$	$\vdash$	
QA check S/Order and dry pack quality	55	0.182		-		-	×	-	<del> </del>
Program Telxon portable scanner for bag labels	1	5		<b>*</b> <		-	_		
Scan bag labels 100%	55	0.236	-			_	*		
Re-Program Telxon portable scanner for box	1	0.230		X<	_	_	^	$\vdash$	
	2	0.273		^	<b>-</b>		Lv	-	
Scan box labels 100%	55 55				-	-	*	-	
QA check bag labels vs. box labels	55	0.145	_	14-	_	-	^	-	<del> </del>
QA stamp on all the boxes' labels		0.091		X-	-	-	-	-	
QA goto terminal and End lot at Genesis	1	5	5	1	├		-		
Seal boxes and strap	-		-	1	-	-	$\vdash$	_	
Goto terminal and print DSF		45	1-45	_	<u> </u>		-	⊢	
Stage for QA final audit	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	45		-	_	×	<b></b>	-	
QA pick up the DSF and verify lot numbers	,140	0.079		-		_	X		
Count number of boxes on the trolley	140	0.057		_	_		<b>  </b> ₹	_	
Check for QA Stamp on the box label	140	0.057				_	1	-	
QA stamp on the DSF	11	3	3	*	-	<u></u>	_	<u> </u>	
Wait for transport to warehouse			-	_		<u>×</u>	_	-	
Push lot to drop ship					×	$\vdash$	-	<u> </u>	
Staged for orders at drop ship	-		<u> </u>	<u> </u>	_	_	-	×	
				<u></u>	_	<u> </u>		<u> </u>	
					_	_	_	_	
					_	_	_	$\vdash$	
							_	_	
Total				10	1	4	7	1	

# Appendix D: Oral Presentation Package



# Re-engineering of the Quality Assurance Process in the End-of-Line Operations Using Work-Study Methodology

Supervisor:

Dr. Tan Lee Peng

Prepared by:

Chia Yew Hoong

02 Feb 2001

(CGA 98009)

Y.H. Chia 02 Feb 2001





# **Agenda**

- Introduction
- · Objective of Project
- Problem
- · Work Study Methodology
- Data Collection
- Benchmark Results
- · Results and Analysis
- Conclusion
- Recommendation

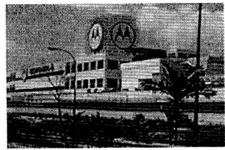
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#### Introduction

- Motorola Malaysia Sdn Bhd
  - established in 1972
  - assemble and test semiconductors:
    - microcontrollers, microprocessors, Digital Signal Processors (DSP), and Fast Static RAMs (FS-RAMs)
  - ~4500 employees
  - End-of-Line Operation
    - · Leads/balls scanning
    - · Tape & Reel
    - · Packing and labeling
  - Output ~5 M/week



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# **Objective of Project**

- Improve the EOL QA OFI Gate Process using the systematic Work-Study method
- Provide a base for expanding this method to improve other processes
- Understand the Work-Study Methodology and adopt it to the current business environment

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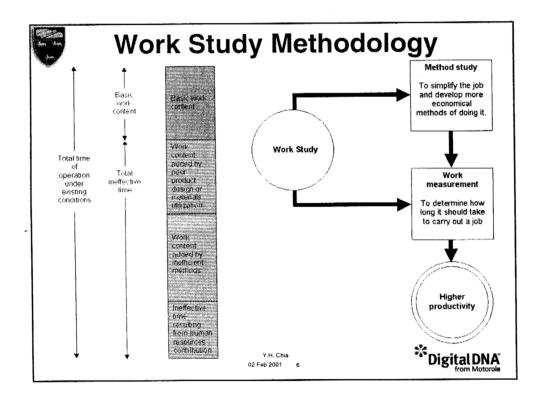


#### The Problem

- End-of-Line QA Process become bottleneck
- · Backlogs build up
- · Overtime needed to cope with volume
- Work overload
- Job content kept increasing
- Tedious and repetitive work

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# **Work Study Methodology**

- 1. Select the work to be studied
- 2. Record the relevant facts
- 3. Examine critically
- 4. Develop the improved method
- 5. Evaluate different alternatives
- 6. Define the new proposed method
- 7. Install the new method
- 8. Maintain the new method

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# **Work Study Symbols**

Symbol	Activity	Description
<i>/</i> ~<	Operation	Indicates the main step in a process, method or
( )		procedure. Usually the part, material or product
1		is modified or changed during the operation
	Inspection	Indicates an inspection for quality and/or check
	Inspection	
		for quantity
,	Transport	Indicates the movement of workers, materials or
<u> </u>		equipment from place to place
	Temporary	Indicates a delay in the sequence of events:
	Storage or	e.g. work waiting between consecutive
	Delay	operations, or any object laid aside temporarily
		without record until required
	Permanent	Indicates a controlled storage in which material
	Storage	is received into or issued from a store under
· ·		some form of authorization, or an item is
		retained for reference purposes
12-50	Combined	Show activities performed at the same time or
	activities	by the same operative at the same workstation
(S-42)		e.g. circle within a square represents a
		combined operation and inspection.
	1	combined operation and inspection.





# Work Study Methodology

#### Why Work-Study?

- raise productivity by simply reorganizing the work
- systematic and ensures no factor affecting the efficiency of an operation is overlooked
- an accurate mean of setting performance standards
- contribute to the improvement of safety & work conditions
- · immediate savings
- can be applied everywhere
- · relatively cheap and easy to apply
- · effective tool to address the issue of inefficiencies

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#### **Data Collection**

- · Outline Process Flow Chart of Present Method
- Layout of the EOL Packing Area
- Detail Process Flow Chart of Present Method
  - sample and record time taken for each activity
  - average the time per unit
  - normalized to standard quantity for comparison
- Apply questioning technique on each activity

- Purpose: WHAT, WHY

- Place: WHERE, WHY

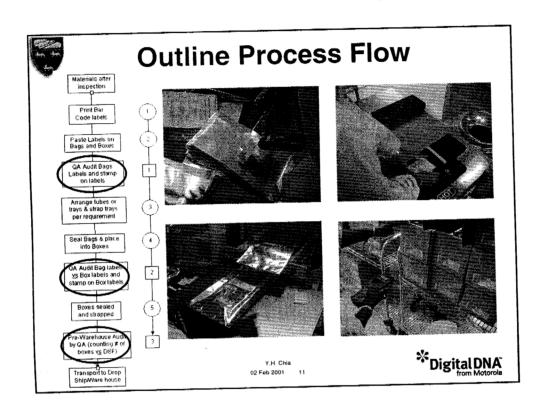
- Sequence: WHEN, WHY

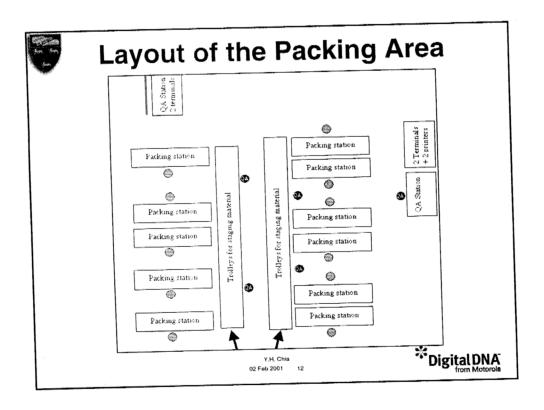
- Person: WHO, WHY

- Means: HOW, WHY

Benchmark SHC Hong Kong







Flow proce	ss chart -	Averag	16							Summary
Chart No. 1 Sheet No. 1 of 1	Activity		Pres			um n		1 6	pnive	
Subject charted: Pack and Label	Operation		11	3/18	P	ropo	sed	1 5	aving	Activity Present Proposed Sav
rack and Laber	Transpor		l ';'	- 1				1	- 1	Operation () 11
ictivity:	Delay	ĕ	1 .	- 1				1	- 1	
abeling, sealing, inspection, straping &	Inspection		, n	- 1				1	- 1	Transport (7) 1
packing	Storage	5	ľ	- 1				1	- 1	1 1
Method: Present	Distance		<del>'</del>	-				+	-	Delay 🐃 5
ocation: Packing Area	Time rec		-	$\rightarrow$				+	-	Inspection 🗔 8
Operative(s):	Cost	*K-11/	-	$\rightarrow$				+		Inspection 🔲 8
and C shift	1,5051	Lation	5	- 1				1	- 1	Storage V 1
Prepared by: YH Chia Date 20Dec2000	1 .	Matonal		- 1				1	- 1	Storage V 1
repared by: TH Chia Date 200902000	Total	Matorial	-	-		-	-	+		•
	10170	Owed		_		-		+		+
	1	Aye.	1					1	- 1	
D	Quantity		Time					1	- 1	A
Description	Channy		(min)	_						Average time for
		time,		Ph	oces	5 5 y	mboi Di 2	He	marks	Average time for
		(Irwf)	-	$\mathcal{O}$	200	2	7	4	$\rightarrow$	•
	-	-	-	-	$\rightarrow$	$\rightarrow$	+	+	-	standard quantity of
rint and paste labels on bags & boxes		12.5	12.5	^	-4	=+	-	+	_	+ Sianoard quantity of
sags sent to OA and wall for audit		0.119		$\rightarrow$	-	~	<del>.  </del>	+		- Otaliaala qualitity of
OA check s/order and count the no. of bags	120	0 119			-	-	*	+-		·
A program the Telxon portable scanner			3.0	M	-	↲	*	+	-	120 = 232 minutes
DA acan bar code labels 100%	120	0.371			_		*	┿	-	120 = 232 11111111110
A stamp on all bags labels	120	0.269	32.3	Xc.	-	-		+		
Wait for bag sealing	-		-	-		*+	-	+	$\overline{}$	4
Arrange/strap lube/trays per requirement	-		-	n	$\rightarrow$	$\rightarrow$	+	+	-	4
Vacuum seal bags and place in boxes	-		-	4	-	-	-	+		-
Walt for QA Drypack audit	1	20		Н	_	М,	-	+		4
3A check dry pack quality	120	0,108		ш	_	-	*	+	-	4
Program Telzon puriable scanner	1	- 3	3.0	$\times$	-	J	.	+		-
Scan box labels 100%	120	0.098		$\vdash$	-	-	*	+-		4
QA check bag labels vs. box labels	120	0.083		ш	_	-	-2.	+	_	4
OA stamp on all the boxes labels	120	0.038		1		_	-	+-		4
OA goto terminal and End lot at Genesis	1	- (	6.0	1		-	-	+		4
Seel boxes and strap	-			1	$\Box$	$\rightarrow$	$\perp$	-		4
Goto terminal and print DSF				1			_	1		-
Stage for QA final audit			24.0			1		-		_
OA pick up the DSF and venly lot numbers	1	н					¥	1		
Count number of boxes on the trolley	120	0.113	13.5				#	1		
Check for OA Slamp on the box label	120	0.068				-	£	_		_
QA stamp on the DSF	1		1.0	*		_	_	+		_
Wait for transport to warehouse	1					$\times I$				_
Push lot to drop ship					УK					
Staged for orders at drop ship	1		$\Gamma$				~ <del> </del> *			
Total			25.357	11		6.	6 1			7

		Summary						
Activity		Present	Proposed	Saving				
Operation	0	11						
Transport	ă	1						
Delay		5						
Inspection		8						
Storage	$\overline{\mathbb{V}}$	1						



**Critical Analysis of Data** past processes.
To ensure correct lot number and quantity and also past processes are completed. rioperty.
This is a necessary step. what else might be Penture scope to just check for processes after VM Gate At the GA OFI gate station GAS need to sit down and sca Casp need to stiftown and so the tasp.

A true troiler, where the motivations are staged as the place most convenient the Casp and at the place between the materials has tendered the materials has tendered the materials has been pasted on Lags out before instead on Lags out before instead are placed in the budg.

Such a convenient to check, entire the convenient to check. completed

After all the pack and taber processes are completed

actively all the pack and taber processes are completed

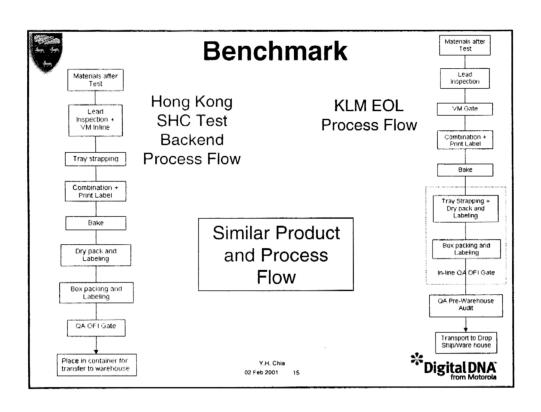
actively appropriately to an adequate processes is

actively and proper processes is

Opportunities for improvement are identified at this stage when each activity are critically analyzed

02 Feb 2001

Digital DNA Motorole



	SHC TEST BACKEND	KLM END-OF-LINE
a)	In-line V/Mechanical Gate Performed by production operators (RVSI operator)	Off-line VM Gate by dedicated QAs
b)	No rework (no lead conditioner).	Use lead conditioner quite extensively
c)	Trays are strapped almost immediately after RVSI using a mini strapper and bake-able strap	Trays strapped using velcro strap manually
d)	Main roles of the QAs are Process Audit and OFI gate (5 QAs/shift X 3 permanent shift).	QAs performed V/M gate, OFI Gate and IPQA (10 QAs/shift)
e)	RAP is pulled at Test area.	RAP pulled at EOL V/M gate
f)	Test summary and Shop Order Audit for the Test portion is performed by Test operators.	Test Summary and Shop Order Audit still performed by EOL QAs
g)	Labels are visually inspected at QA OFI	Labels are scanned 100% using the TELXON verifier by QAs at OFI gate



#### Alternatives identified

Based on the results of critical analysis and benchmark several alternatives were identified:

- Eliminate Stamping of bag labels
- Combine the bag label verification with box label verification
- Delegate bar code scanning task to production operators
- New method of scanning labels

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**Results and Analysis** 

Alternatives chosen:

- Eliminate Stamping of bag labels
- Combine the bag label verification with box label verification

#### Summary of Results:

		Summary						
Activity		Present	Proposed	Saving				
Operation	O	11	10	1				
Transport		1	1	0				
Delay	$\Box$	5	4	1				
Inspection		8	7	1				
Storage	$\overline{\nabla}$	1	1	0				
Time (min)		232	178.3	53.7				

Chair No. 5 Sheet No. 1 of 1 Serving Premark Surrous Source Charles Country Premark Serving Premark Serving Premark Serving Country Premark Serving Premark Serving Country Premark Serving Country Serving Se

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#### Conclusion

- Average cycle-time reduction = 23%
- One step reduction in Operation, Delay and Inspection
- Bottleneck reduced significantly
- Identified other opportunities along the process
- · Benchmarking help accelerate improvement

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# Recommendation

- Expand method to other processes in KLM
- · Use results to define work standards
- Explore alternative to transfer scanning of bar code labels to production operators
- Study workers movement and layout
- Feasibility to expand scanning capability to one single scan to capture all 4 bar codes
- Explore further the differences found in benchmarking





# **Thank You!**

