TWENTY THIRD ANNUAL

May 1 - 4, 2022

TestConX

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Operations 2

KISS 2.0 Keep It Simple & Save in Burn-In Operation 2.0

Joe Tan, Founder & MD Chun Hong Low, Senior Engineer



Mesa, Arizona • May 1-4, 2022



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Content

1) Quick Recap of KISS @ TestConX China 2021

- https://www.testconx.org/premium/testconx-china-2021/

- Session 1: "KISS (Keep It Simple & Save) in Burn-In Operation"

2) How Does the Innovation Compare? – (Trolley Oven + Trolley BLU) v/s (Rack / Hybrid / Manual)

3) Simplified Alignment & Sealing Mechanism



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Quick Recap of KISS Manual Oven + Trolley BLU (MO+TB) **Manual Transfer Trolley Transfer BIB Txfr 2 Burn-In** Move 3 **Burn-In** BIB BIB Loader System Trolley Trolley BIB Txfr 1 Move 4 Unloader Trolley Transfer **BIB Trolley Parking Area** Test**ConX**® **KISS 2.0** 2022 Keep It Simple & Save in Burn-In Operation 2.0

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Patented Frame, Chamber, Apparatus



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Patented Transfer Method



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Quick Recap of KISS

	Problems	Conventional System & Method	Muda <mark>X</mark> System & Method	Muda <mark>X</mark> Gain
1	Operator Fatigue/Injury	Yes	Reduced	
2	Time Wastage	Significant	Little	「
3	BIB/Skt/FTC Damage	Yes	Reduced	OEE个 Safety个
4	Size & Weight of BIB	Significant Effect on A, B, C	Little Effect	
5	Non Value Add Movement	Significant	Insignificant	Cycle Time 🗸
6	Non Value Add Space	Significant	Insignificant	Cost ↓ Space ↓
7	Limited BIC / BLU Integration	No, or Limited	Full Integration	
8	Complex Automation	Difficult & Extremely Costly	Easy & Less Costly	Simplified
9	Difficulty in BIB Tracking	Very Difficult	Easy	Burn-In Area Management
10	Managing BIB Inventory	Very Difficult	Easy	
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Simulation Model Conditions

Model of Small Burn-In Cell

Cell Configuration	1 BLU + 6 Burn-In Oven	
Burn-In Hours	6 hour (21,600sec)	
Operator Count	1 BLU Operator + 1 Oven Operator	
Burn-In Oven Capacity	24 BIB	
Burn-In Loader/Unloader (BLU) Speed	7,200UPH (1 BIB in 50sec)	
Burn-In Board (BIB) Density	100 Socket/BIB	
*Burn-In Board (BIB) Quantity	7 Trolleys of 24 BIB (Total 168 BIBs)	

*Remarks:

- 7 Trolley Paired to 6 Ovens to Fully Utilize Oven Capacity



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Simulation Model Conditions

	TO+TB	RO+RB	MO+TB	MO+MB	
BIB Transfer Time to BLU	10s	15s + 15s (2 racks of 12 BIBs)	10s	210s	
BIB Transfer Time from BLU	5s	15s + 15s (2 racks of 12 BIBs)	5s	210s	
BIB Transfer Time to Oven	10s	15s + 15s (2 racks of 12 BIBs)	210s	210s	
BIB Transfer Time from Oven	5s	15s + 15s (2 racks of 12 BIBs)	210s	210s	
*Socket Damage Rate	5 in 4 weeks	5 in 4 weeks	10 in 4 weeks	20 in 4 weeks	
*BIB Damage Rate	1 in 4 weeks	1 in 4 weeks	2 in 4 weeks	4 in 4 weeks	
Pretest Time	300s	300s	600s	1200s	
BLU Operator Utilization During BLU Operation	120s (10% of 1200s)	120s (10% of 1200s)	240s (20% of 1200s)	480s (40% of 1200s)	
*Socket & BIB Damage Recovery Once Every 4 Weeks					



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Session 5 Presentation 1

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Simulation Model Conditions

Conditions for Very High BLU & Oven Utilization



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Simulation Model Conditions

1) Trolley Oven + Trolley BLU (TO+TB MudaX) BU Operator 30 10 180 1,200 180 0 0 1200 180 3 30 Unload Releved BBLU Operator 30 10 180 1200 180 1 100	1) Trolley Oven + Trolley BLU (TO+TB MudaX) Oven Oyer Cycle TT 020V TT 02V PT 0V OV OF TT 022T TT 0V20 Oven Operator / Oven 12 0 10 100 22,600 5 30 Oven Operator / Oven 12 0 10 100 100 100 100 100 100 100 100	
2) Rack Oven + Rack BLU (RO+RB) RUCycle R127 TT 028UU RT 73UU TT 8U202 RT 021 TT 028UU RT 73UU RT 720U RT 720 TT 028UU RT 73UU RT 720 TT 028UU RT 78U202 RT 720 TT 028U RT 78U202 RT 720 TT 028UU RT 78U20 RT 720 TT 028UU RT 78U	2) Rack Oven + Rack BLU (RO+RB) Dven Cycle RT Q27 TT Q20V RT T20V RT T20V RT T20V RT Q27 TT Q20V RT T20V RT T20V RT T20V RT OV27 TT Q20V RT Q	
3) Manual Oven + Trolley BUU (MO+TB) RUC Over + Trolley BUU (MO+TB) RUC Over + Trolley BUU (MO+TB) RUC + Trolley BUU (MO+TB) RUC + TRAUZO RUC + TRAUZO	3) Manual Oven + Trolley BLU (MO+TB) Oven Cycle TTO2OV TO2OV <th col<="" th=""></th>	
4) Manual Oven + Manual BLU (MO+MB) But Option TT Q3BUT RT12BUT BUT SU BUT OF BUT OF BUT OF BUT OF BUT TT BUT OF BU	4) Manual Oven + Manual BLU (MO+MB) Oven Cycle TT 0200 0ven Operator / Oven #1 30 210 100 21,600 210 30 210 1200 Oven Operator / Oven #2 30 210 30 210 30 Oven Operator / Oven #2 30 210 30 210 300 Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2"Colspa="2"Colspa="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colsp	

Observation:

- 1. TO+TB (MudaX) process has lowest overall transfer steps & time
- 2. RO+RB (Rack) process requires a lot of transfer steps
- 3. MO+TB (Hybrid) process has low transfer step time @ BLU process
- 4. MO+MB (Manual) process requires a lot of transfer time

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Simulation Model Compartmentalized & Calculated by Excel **Process Flow Model Validated BLU Operator Working Area Oven Operator Process Flow Model View Working Area** (Internal to Modelling Software) Test**ConX**® **KISS 2.0** 2022 15 Keep It Simple & Save in Burn-In Operation 2.0

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Summary

M	With Exact Same Resources MudaX ve Other Process					
With Exact Same Resources, Muuar vs Other Process						
1	Burn-In Cycles	▲ Up to 6.0%				
2	Throughput	▲ Up to 7.1%				
3	Throughput Lost Due to Damage		▼ Up to 1.0%			
4	BLU Max Possible Utilization	▲ Up to 8.5%				
5	BLU Overall Utilization		▼ Up to 5.5%			
6	Oven Overall Utilization	▲ Up to 5.5%				
7	BLU Operator Utilization		▼ Up to 27.4%			
8	Oven Operator Utilization		▼ Up to 33.1%			
It Seems the Gain is Mostly Compared to Manual Process?						
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Rack Oven/BLU & Trolley BLU Alignment Issue

Rack Oven & Rack BLU

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- Problems with Uneven Production Floor
- Cumbersome to Align Trolley to Oven/BLU
- Rack Transfer Operation is Tedious
- Robust Docking Required for Rack Alignment

Trolley BLU (Hybrid Process)

- Problems with Uneven Production Floor
- Cumbersome to Align Trolley to BLU
- Typically Resolved by Installing Platform on Floor to Achieve Alignment





Some Companies Faced So Much Troubles with Alignment Converted Process back to Manual Oven + Manual BLU

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Simple Rack to Trolley BLU Upgrade



Overcoming Problems of Uneven Production Floor

"Such automation has <u>made</u> <u>her job easier and less</u> <u>backbreaking</u>, as compared to the tedious task of having to transfer the chips (boards) one by one previously, she said."

She added: <u>"I'm happy (that) I</u> <u>can do new things and</u> <u>contribute (to the company)."</u>



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Simplified BIB Alignment PATEN TestConX[®] 2022 **KISS 2.0** 24 Keep It Simple & Save in Burn-In Operation 2.0

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Simplified Chamber Sealing Oven @125'C Mud e=0.95 38.7°C MIN:28.2*C 10:16 PATENT PENDING ABLE FOR LI TestConX[®] **KISS 2.0** 2022 25 Keep It Simple & Save in Burn-In Operation 2.0

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Automatic Extraction / Insertion Mechanism



Simple Motorized Mechanism

Estimated Time for 24 BIBs

Extraction: <240 (4min) Insertion: <120s (2min)

Automatic extraction when cycle end to save time



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Conclusion: KISS Keep ATENT MudaX t Simple & Save • Operator **Burn-In Board** Capacity • Time Money Space Automation Management Maintenance Test**ConX**® **KISS 2.0** 2022 27 Keep It Simple & Save in Burn-In Operation 2.0

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