LG Electronics Development Project

* Source Code - GitHub Repository

Project	Program	Random Data Same function, no need data file	System Data Real use, need data file
Python Big Data Analysis	Service & Sales Trend	https://github.com/EunbiYoon/ServiceSales_RandomData.git	https://github.com/EunbiYoon/ServiceSales.git
	Product Realtime Monitoring	https://github.com/EunbiYoon/RealtimeMonitoring_RandomData.git	https://github.com/EunbiYoon/RealtimeMonitoring.git
	Product Cost Comparison	https://github.com/EunbiYoon/ProductCost.git	
	Automatic Notice to Technician	https://github.com/EunbiYoon/TechnicianNotice.git	
Quality Indicator	Quality Indicator	https://github.com/EunbiYoon/QualityIndicatorsRandomData.git	https://github.com/EunbiYoon/QualityIndicators.git
Vision System	Vision System	https://github.com/EunbiYoon/VIsionSystem.git	
	Vision Inspection Data Analyze	https://github.com/EunbiYoon/VisionData_RandomData.git	https://github.com/EunbiYoon/VisionData.git
	Product Defect Cause Analyze	https://github.com/EunbiYoon/ProductDefect.git	
Web Application	LG Website	https://github.com/EunbiYoon/LGVideoTutorial_Website.git	
	Portfolio Website	https://github.com/EunbiYoon/Portfolio_Website.git	

* Webs Application - HTTP Address

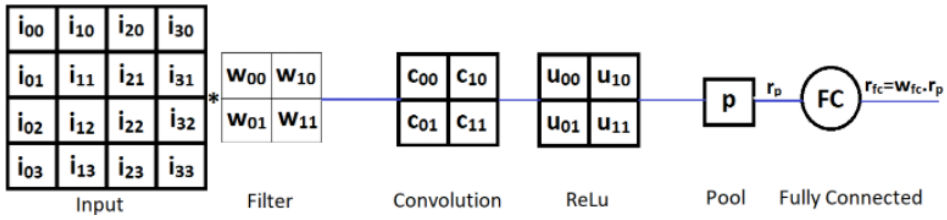
- LG Video Tutorial Website
  http://ec2co-ecsel-18wyuowhrfffe-499695824.us-east-1.elb.amazonaws.com:5000/

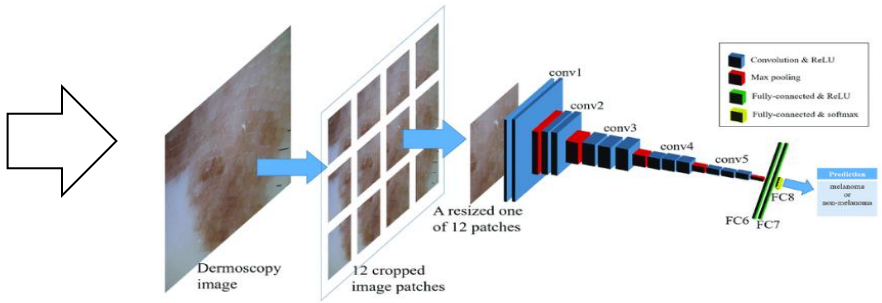
- Portfolio Website **(Please visit portfolio website, I posted all development detail in here.)**

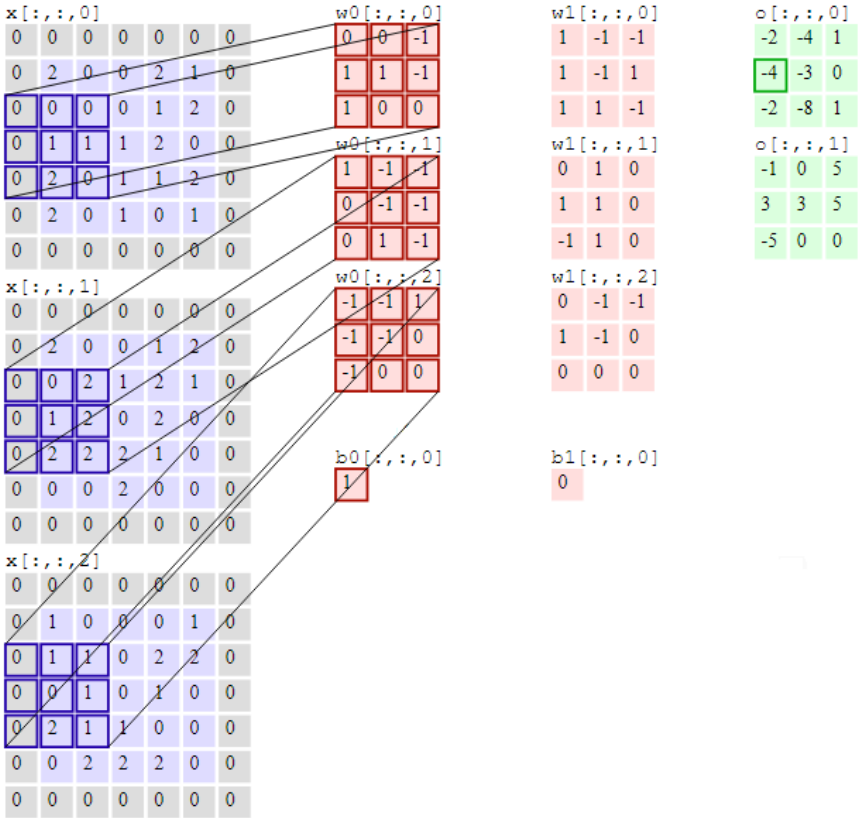
1. Deep Learning Vision System

Modeling

* Convolution Neural Networks







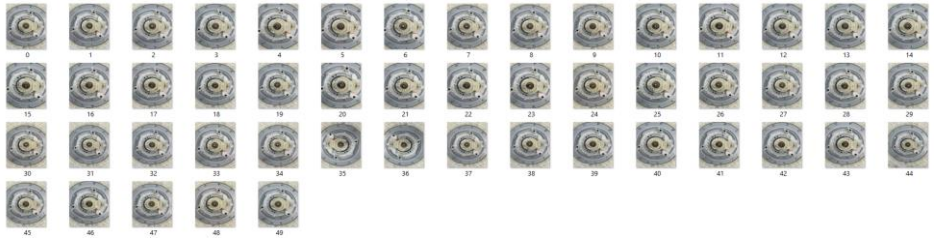
Build Code

```
model = tf.keras.models.Sequential([tf.keras.layers.Conv2D(16, (3, 3),
activation='relu', input_shape=(200, 200, 3)),
                    tf.keras.layers.MaxPool2D(2, 2),

                    tf.keras.layers.Conv2D(32, (3, 3), activation='relu'),
                    tf.keras.layers.MaxPool2D(2, 2),

                    tf.keras.layers.Conv2D(64, (3, 3), activation='relu'),
                    tf.keras.layers.MaxPool2D(2, 2),

                    tf.keras.layers.Flatten(),

                    tf.keras.layers.Dense(512, activation='relu'),

                    tf.keras.layers.Dense(1, activation='sigmoid')])
```

1. Deep Learning Vision System

1. Training File

OK

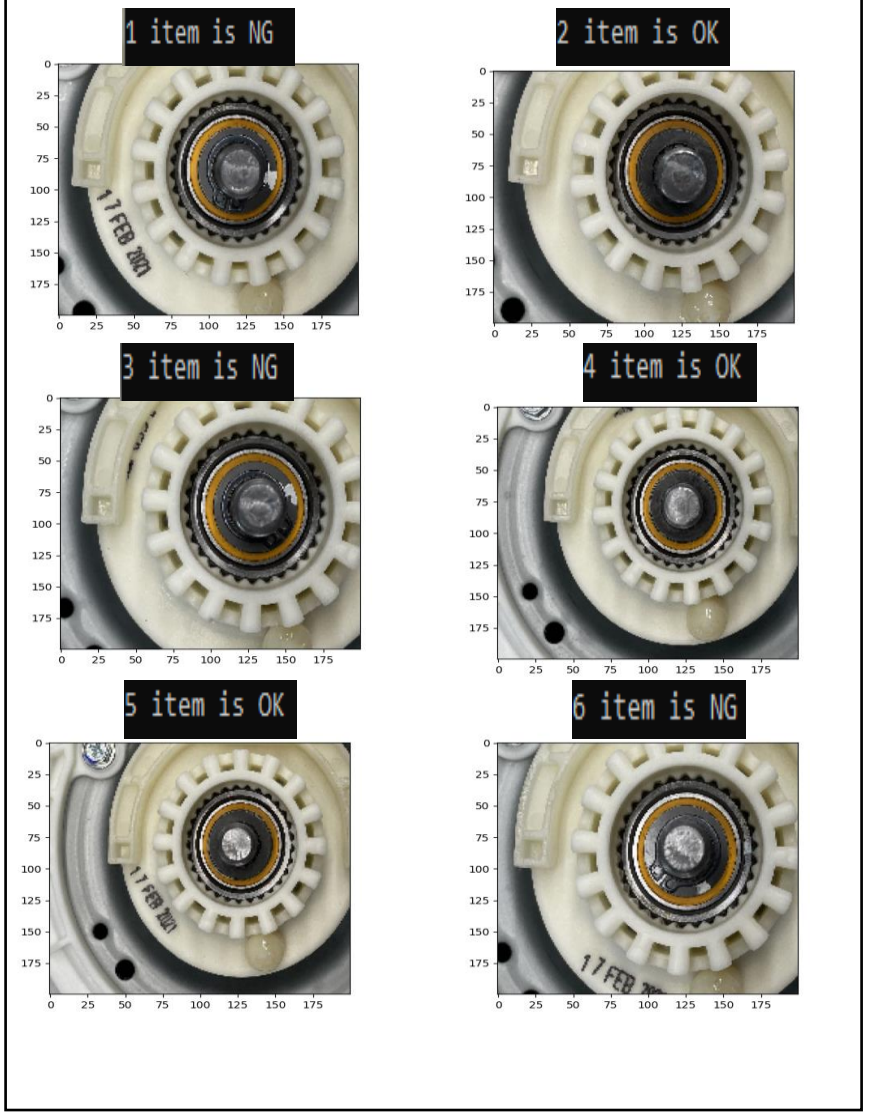


NG

2. Machine Learning

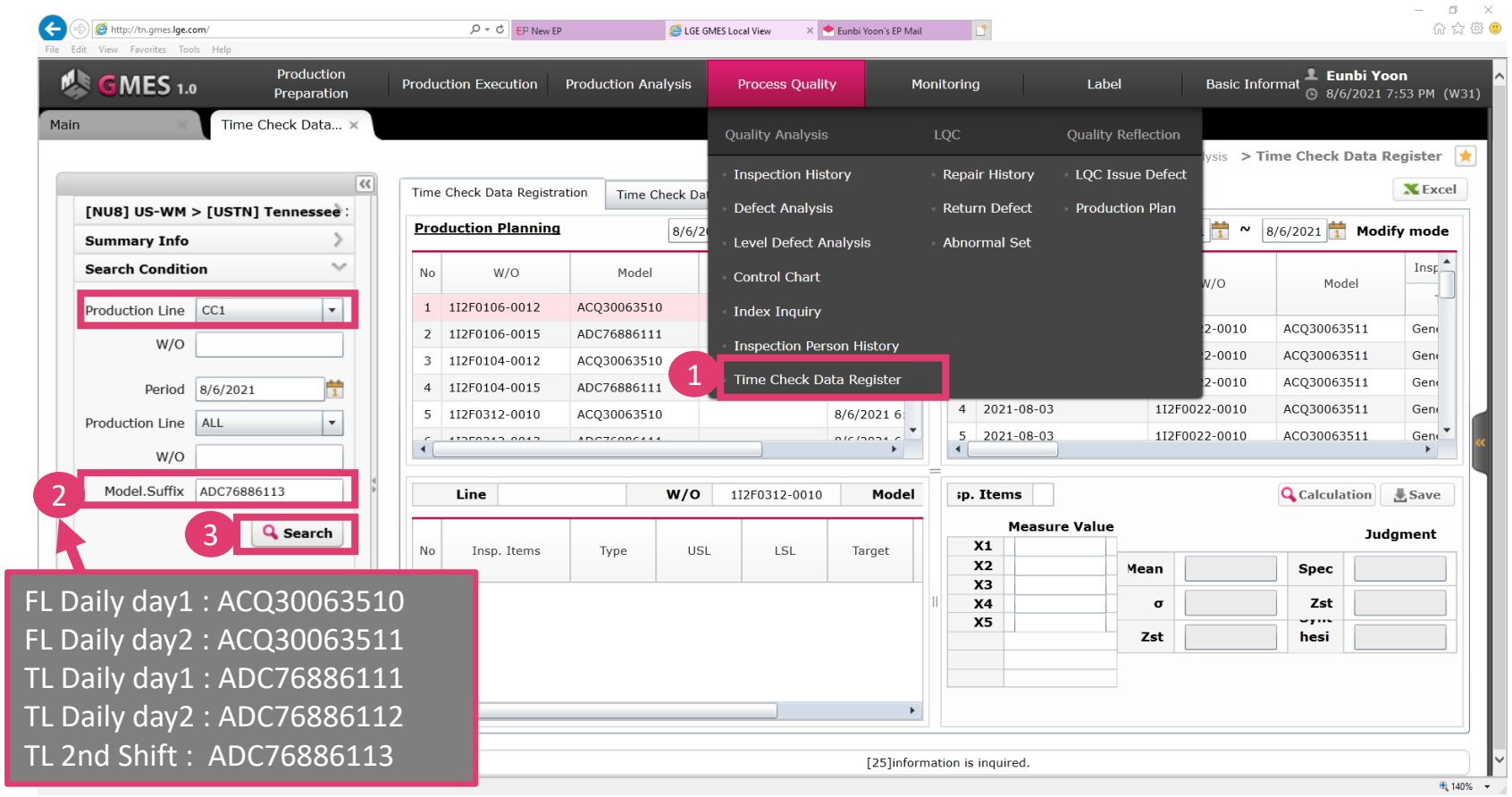
```
To silence this warning, decorate the function with @tf.autograph.experimental.do_not_convert
31/31 [==============================] - 14s 438ms/step - loss: 1.1243 - accuracy: 0.6630 - val_loss: 0.7575 - val_accuracy: 0.5543
Epoch 2/30
31/31 [==============================] - 13s 426ms/step - loss: 0.4936 - accuracy: 0.7609 - val_loss: 0.6082 - val_accuracy: 0.6848
Epoch 3/30
31/31 [==============================] - 13s 420ms/step - loss: 0.7356 - accuracy: 0.8587 - val_loss: 0.1960 - val_accuracy: 0.9130
Epoch 4/30
31/31 [==============================] - 13s 422ms/step - loss: 0.3261 - accuracy: 0.8261 - val_loss: 0.1077 - val_accuracy: 0.9891
Epoch 5/30
31/31 [==============================] - 13s 424ms/step - loss: 0.1520 - accuracy: 0.9457 - val_loss: 0.0598 - val_accuracy: 0.9891
Epoch 6/30
31/31 [==============================] - 13s 422ms/step - loss: 0.1052 - accuracy: 0.9674 - val_loss: 0.0095 - val_accuracy: 1.0000
Epoch 7/30
31/31 [==============================] - 13s 427ms/step - loss: 0.0044 - accuracy: 1.0000 - val_loss: 0.0021 - val_accuracy: 1.0000
Epoch 8/30
31/31 [==============================] - 13s 423ms/step - loss: 5.0873e-04 - accuracy: 1.0000 - val_loss: 7.4761e-05 - val_accuracy: 1.0000
Epoch 9/30
31/31 [==============================] - 13s 419ms/step - loss: 0.4378 - accuracy: 0.9674 - val_loss: 0.0080 - val_accuracy: 1.0000
Epoch 10/30
31/31 [==============================] - 13s 429ms/step - loss: 0.0035 - accuracy: 1.0000 - val_loss: 0.0012 - val_accuracy: 1.0000
Epoch 11/30
31/31 [==============================] - 13s 426ms/step - loss: 0.0013 - accuracy: 1.0000 - val_loss: 1.5953e-04 - val_accuracy: 1.0000
Epoch 12/30
31/31 [==============================] - 13s 431ms/step - loss: 0.0834 - accuracy: 0.9891 - val_loss: 7.0411e-04 - val_accuracy: 1.0000
Epoch 13/30
31/31 [==============================] - 13s 433ms/step - loss: 0.0583 - accuracy: 0.9891 - val_loss: 6.8685e-04 - val_accuracy: 1.0000
Epoch 14/30
31/31 [==============================] - 13s 428ms/step - loss: 3.0096e-04 - accuracy: 1.0000 - val_loss: 1.7027e-04 - val_accuracy: 1.0000
Epoch 15/30
31/31 [==============================] - 13s 428ms/step - loss: 1.0493e-04 - accuracy: 1.0000 - val_loss: 1.4414e-05 - val_accuracy: 1.0000
Epoch 16/30
31/31 [==============================] - 13s 433ms/step - loss: 9.9841e-06 - accuracy: 1.0000 - val_loss: 1.7566e-05 - val_accuracy: 1.0000
Epoch 17/30
31/31 [==============================] - 13s 425ms/step - loss: 3.0335e-06 - accuracy: 1.0000 - val_loss: 1.6196e-06 - val_accuracy: 1.0000
Epoch 18/30
31/31 [==============================] - 13s 431ms/step - loss: 5.5587e-07 - accuracy: 1.0000 - val_loss: 1.8660e-07 - val_accuracy: 1.0000
Epoch 19/30
31/31 [==============================] - 13s 431ms/step - loss: 1.7717e-07 - accuracy: 1.0000 - val_loss: 7.6311e-08 - val_accuracy: 1.0000
Epoch 20/30
31/31 [==============================] - 13s 431ms/step - loss: 6.1431e-08 - accuracy: 1.0000 - val_loss: 1.0748e-08 - val_accuracy: 1.0000
Epoch 21/30
31/31 [==============================] - 13s 432ms/step - loss: 1.3010e-08 - accuracy: 1.0000 - val_loss: 3.1134e-09 - val_accuracy: 1.0000
Epoch 22/30
31/31 [==============================] - 14s 437ms/step - loss: 3.5202e-09 - accuracy: 1.0000 - val_loss: 4.7945e-09 - val_accuracy: 1.0000
Epoch 23/30
31/31 [==============================] - 13s 427ms/step - loss: 1.6730e-09 - accuracy: 1.0000 - val_loss: 1.6660e-09 - val_accuracy: 1.0000
Epoch 24/30
31/31 [==============================] - 13s 433ms/step - loss: 1.9852e-09 - accuracy: 1.0000 - val_loss: 4.8412e-10 - val_accuracy: 1.0000
Epoch 25/30
31/31 [==============================] - 13s 433ms/step - loss: 5.0523e-10 - accuracy: 1.0000 - val_loss: 6.0114e-10 - val_accuracy: 1.0000
Epoch 26/30
31/31 [==============================] - 13s 432ms/step - loss: 7.5238e-10 - accuracy: 1.0000 - val_loss: 8.7793e-10 - val_accuracy: 1.0000
Epoch 27/30
31/31 [==============================] - 13s 433ms/step - loss: 1.0900e-09 - accuracy: 1.0000 - val_loss: 1.1702e-09 - val_accuracy: 1.0000
Epoch 28/30
31/31 [==============================] - 13s 427ms/step - loss: 1.3656e-09 - accuracy: 1.0000 - val_loss: 1.4572e-09 - val_accuracy: 1.0000
Epoch 29/30
31/31 [==============================] - 13s 435ms/step - loss: 1.0235e-09 - accuracy: 1.0000 - val_loss: 2.2575e-10 - val_accuracy: 1.0000
Epoch 30/30
31/31 [==============================] - 13s 431ms/step - loss: 2.2156e-10 - accuracy: 1.0000 - val_loss: 2.6989e-10 - val_accuracy: 1.0000
```

3. Tes Result



2. Automatic GMES Line Audit System

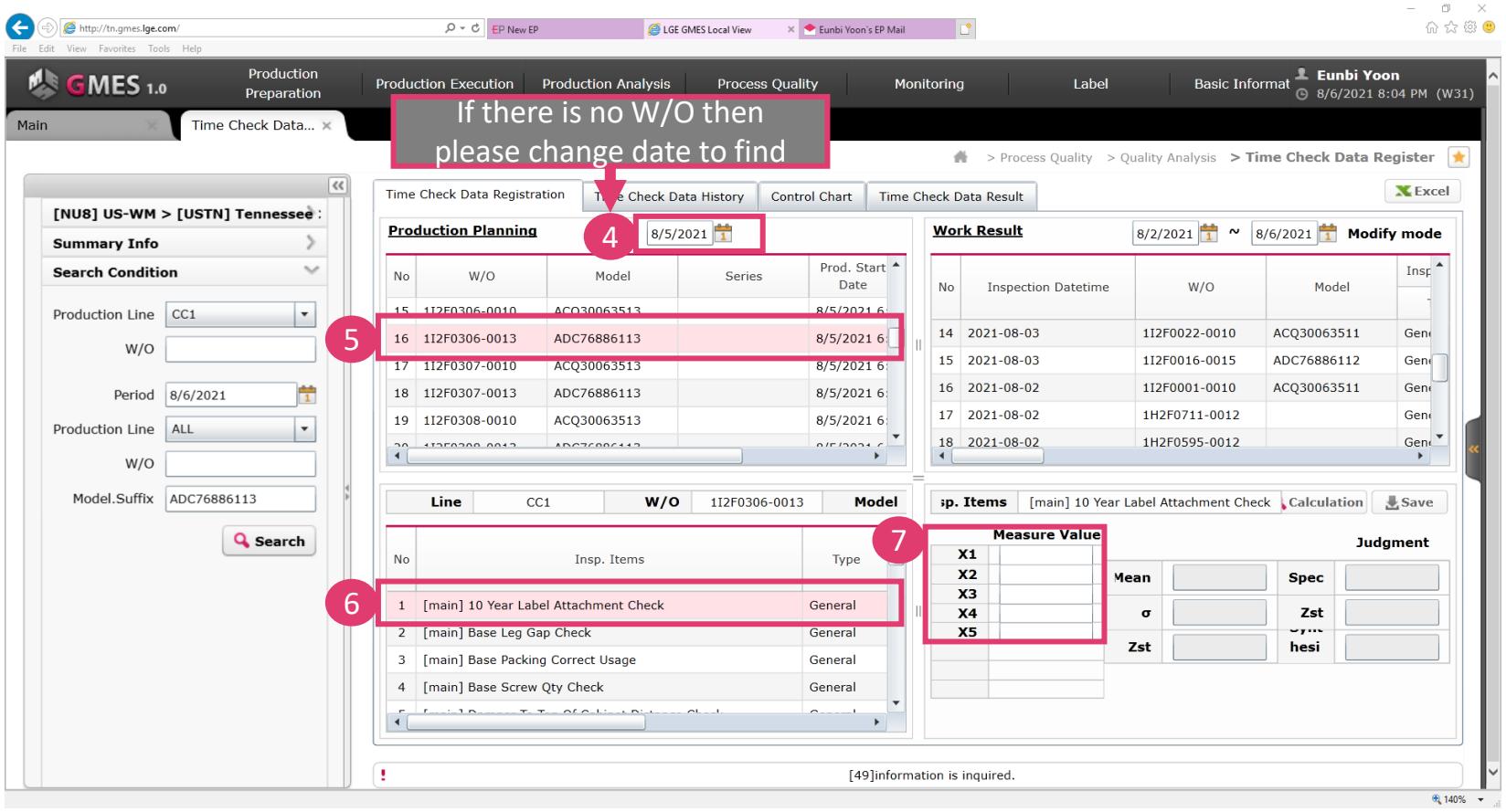
System Guide(1/5)



FL Daily day1 : ACQ30063510
FL Daily day2 : ACQ30063511
TL Daily day1 : ADC76886111
TL Daily day2 : ADC76886112
TL 2nd Shift : ADC76886113

2. Automatic GMES Line Audit System

System Guide(2/5)

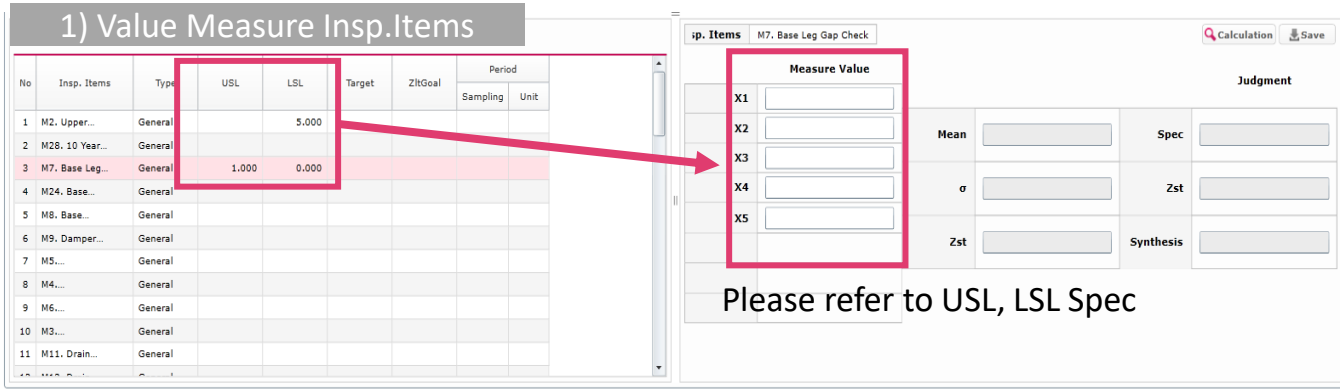


2. Automatic GMES Line Audit System

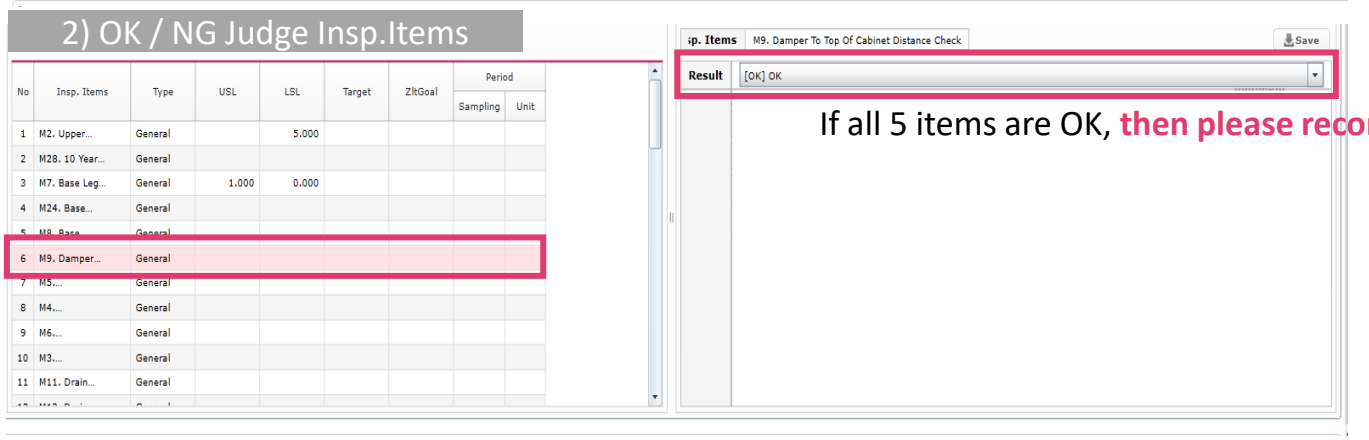
System Guide(3/5)

Some of item is only OK and NG ,Some of item let you put value. For OK and NG Judege items, please save OK one items after checking all the five items are OK. For value measuring items, please refer to USL, LSL spec and put the value what you measured

1) Value Measure Insp.Items



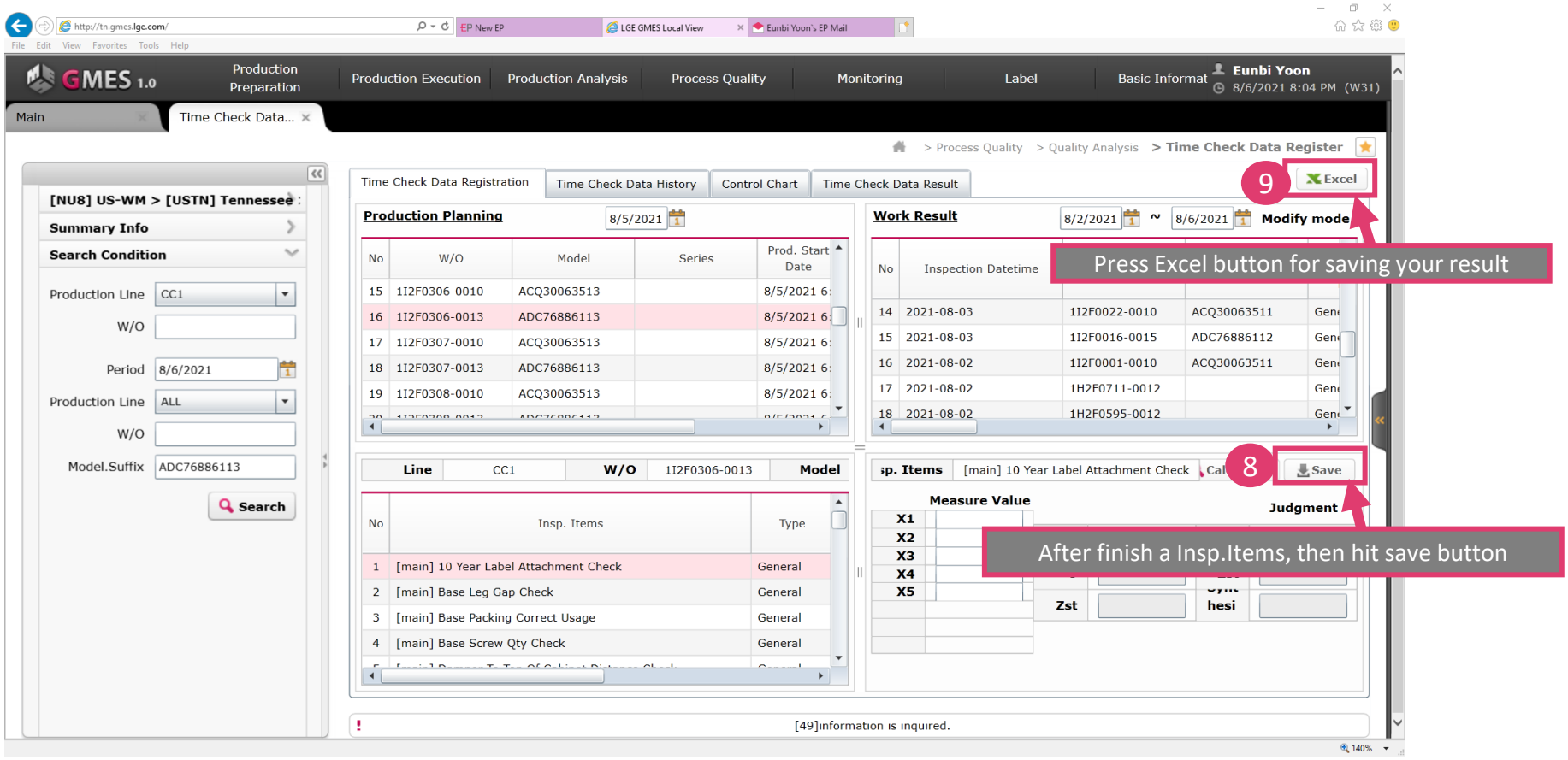
2) OK / NG Judge Insp.Items



If all 5 items are OK, **then please record to 1 time OK**

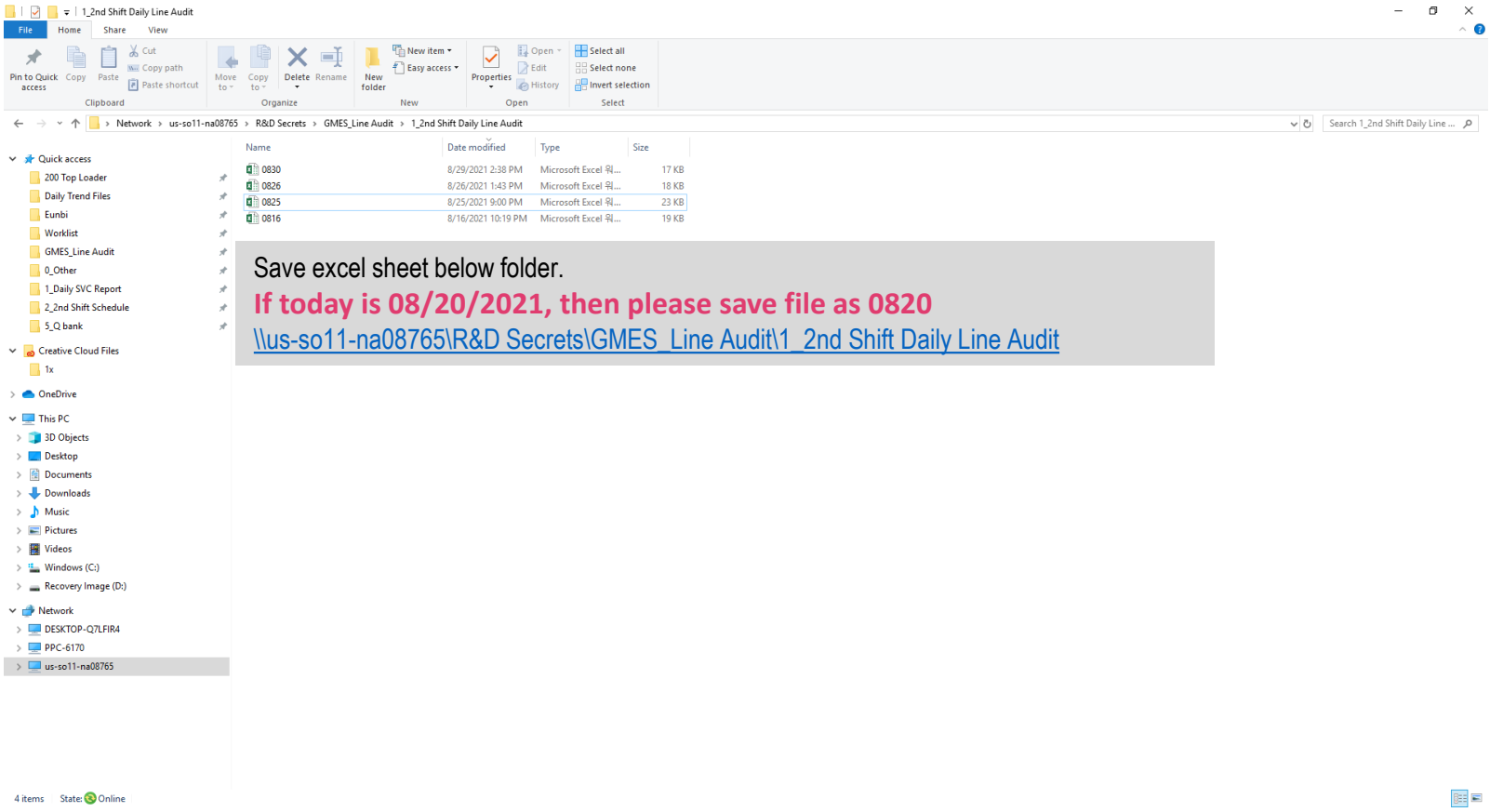
2. Automatic GMES Line Audit System

System Guide(4/5)



2. Automatic GMES Line Audit System

System Guide(5/5)



Save excel sheet below folder.

If today is 08/20/2021, then please save file as 0820

\\us-so11-na08765\R&D Secrets\GMES_Line Audit\1_2nd Shift Daily Line Audit

2. Automatic GMES Line Audit System

As - Is

[Daily report 8/12] TN Factory Top Loader Line Audit by R&D

LGEUS TN R&D Team **Eunbi Yoon** R&D Associate (eunbi1.yoon@lge.com, 1-201-816-2000) + Address book

Recipient To : H&A Quality Management Division **Lee Sujong** Vice President/Division Leader (sujong.lee@lge.com, 82-055-717-1100) and 42

Dear HA Quality Management Division President,

I'd like to report the Daily TN Factory Top Loader Line Audit by R&D

1. Issue items : None
2. Daily Top Loader Audit results
2-1) Main Line (13 check points, Image #1)
2-2) Sub Line (20 check points, Image #1)
3. 2nd Shift Audit Result (Start from 5/3)
3-1) Main Line (26 check points, Image #3)
3-2) Sub Line (35 check points, Image #4)

* Image1 : 2-1) Daily Audit (Main Line)
Image2 : 2-2) Daily Audit (Sub Line)
Image3 : 3-1) 2nd shift Audit (Main Line)
Image4 : 3-2) 2nd shift Audit (Sub Line)

Image1 : 2-1) Daily Audit (Main Line)

Main Line			8/11/2021		
Symptom	Check	Failing Condition	Time	Picture	Result
Lower & Upper Plate Check	Checking the attaching force after Taxing	1. If a plate pops off, test is NG	9:00~10:00		5/5 OK
Drain Hose Insert	Checking how line worker assembles the drain hose into the cabinet	1. If the worker scrapes the drain hose roughly while inserting, then the process is NG			10/10 OK
Applying Bond for pump and drain hose	Check to see if connect amount of bond is being applied	1. If there is not enough bond, NG 2. If there is excessive bond, NG			5/5 OK
Attaching the bellows ~ drain pump	Check to see if the bellows is correctly attached with clamp ring	1. If clamp is in wrong position, NG 2. If bellows is not firmly attached, NG			10/10 OK
Connecting drain pump harness	Check to see if harness is attached t pump	1. If harness comes detached in either point, NG			10/10 OK
Fastening the top cover screw	Checking that screws are fully fastened for the top cover ~ cabinet fastening	1. If screw is not seated correctly, the result is NG			10/10 OK
Drain Hose holder screw-in	Checking the appearance of the drain hose support screw in	1. If screw causes damage to holder the result is NG			5/5 OK
Hinge inserted for horizontal damper	Check the hinge that attached the horizontal damper to the outer tub	1. If pin is not all the way down where plastic tab sticks out, NG 2. If pin is missing completely, NG			30/30 OK
Suspensions seated in upper hangers	Check to see if sub tub assy is correctly seated in cabinet from insert robot	1. If suspension is seated out side of hole on upper hanger, NG			10/10 OK
Pulsator / Agitator screw torque check	Check to see if the correct torque is applied for the pulsator / agitator bolt	1. If the torque is not 70~100kgf, NG Spec: 70-95 kgf*cm			80-83kgf*cm 10/10 OK
Rating Label Check	Check to see if the correct rating label is used for the correct model	1. If the model number is not on the current rating label being supplied, NG			1/1 OK
Light leakage on top cover assy	Check the status of light leakage on top cover assy	1. If light leakage occurs, NG			10/10 OK
Manual Check	Checking version of manual	1. If the version is not the correct version, NG			1/1 OK
Inspector				Russell Wilson	

Image3 : 3-1) 2nd shift Audit (Main Line)

Main Line			8/19/2021
Part	Item	Standard	Result (Sp~Bp)
Lower & Upper Plate Check	Force Check	>5kgf	7.0\5.8\6.3\5.3
Caulking	Caulking assembly, Upper	Measure depth of caulking (L, R)	2.39\2.39\2.37\2.32\2.32\2.32\2.27\2.42
Caulking	Caulking assembly, Lower	Measure depth of caulking (L, R)	2.55\2.37\2.37\2.29\2.3\2.28\2.5\2.49\2.39\2.38\2.29\2.32
Base Leg	Black Leg Assembly	Gap ≤ 1mm	OK
Base Screw	Base Screw Assembly	Drain Pump = 1 screw / Base = 3 screws	OK
Damper	Damper Assembly	Check distance of the damper to top of cabinet	76\57\52
Drain Pump Harness	Drain Pump harness check	Check harness, should be no pinching	OK
Drain Hose Insert	Drain Hose installation	Drain hose should be seated. No drain hose damage	OK
Bond application	Drain Hose & Bellows	Amount Check	15mm
Bellows	Attaching bellows to drain pump	Check the bellows groove with pump rib. Check gap between Bellows & Pump Rib (<1mm)	OK
Multi-harness	Connnecting all connections for multi-harness	Secured Harness Connections	OK
Multi-harness	Check wire tie connection	Distance between Wire tie & Cabinet > 20mm	OK OK OK
Top Cover Screw	Installating top cover screws	Should be applied	>25
Drain Hose Holder	Holder screw installation	Should be applied No Holder Damage	OK
Ground wire screw	Ground wire screw installation	Ground wire screw gap <0.1mm	OK
Pressure Tube	Pressure Tube Installation	Tube ~ Cabinet Gap < 1mm,Clamp ~ Cabinet distance 2~10mm	OK\3mm
Suspension Greaze	Suspension Grease Application	Grease applied 180mm above cap,Distance exceeded < 5mm	120mm
Rear Cover	Screw Installation	Gap < 0.1mm	OK OK OK OK
Base Packing	Base Packing correct usage	Check 5.0 or 5.5	5
Light leakage on top cover assy	Check Appearance	Light defect should not occur	OK
Energy Label Check	Check model	Correct label should be applied	WT7300C
Rating Label Check	Check model	Correct label should be applied	WT7300CW
10 Year Label	Stick attachment	Stick attachment	35\35
Top Cover Assy	Top Cover Gap	Left: <1.8mm / Middle: <1.8mm / Right: <1.8mm	OK OK OK
Pulsator / Agitator screw torque check	Fixing Torque	70~95kgf	84.71
Hinge to H-Damper	Hinge installation	Should be applied	<1.9
Suspensions	Suspensions installation	Should be seated	OK

Image4 : 3-2) 2nd shift Audit (Sub Line)

Sub Line			8/19/2021
Part	Item	Standard	Result (Sp~Bp)
Inner tub frame	Plasma Graph	Settings: 1.6 V	2.4
Inner Tub Frame	Gap Check	Start < 0.15 / Middle < 0.25 / End < 0.15	0.07 0.090 12
Inner Tub Frame	Power Check	Powr: 3250\3400W / Setting: 3200W	3324
Inner Tub Frame	Shield Gas Check	Upper/Lower Gas Shield: 18\19 l/min	86.37 86.06
Inner Tub Frame	Light Leakage Check	>= 3200	3833
Balance	alance Welding jig cleanin	1time/10 samples (Check with MFG)	OK
Balance	Part Weight	2080±30g	2094 2066
Balance	Inner Weight	1480±30g	1494 1484
Balance	Outer Weight	1390±30g	1396 1415
Balance	Total Weight	4930±50g	4944 4967
Balance	Weld Height	Under 2.5mm	2.3
Inner tub frame	out Beading width	Above 0.5mm	0.85
Inner tub Assy	run-out	Under 2.5mm	0.8
Inner tub Assy	Height	5.0\ 596.8\15.5\ 5\ 846.3\15	597.2
Bearing Housing	Taper~ Agitator/ Pulsator	Agitator= A Type \ Pulsator= B Type	B
Bearing Housing	21 Washer	Should be Applied	OK
Stator	Nut Torque	70~80kgf	127.664 127.676 127.671
Rotor	Nut Torque	450\650kgf / Real Check: 200~300kgf	472.5\605\550
Bellows	Bellows Installation	Should be applied in correct position\Distance\bellows' arrow line < 5mm	OK
pulsator	Vertical run out	Under 2	OK
pulsator	Side run-out	Under 1	OK
pulsator	Radius	223±0.5	29.6 to 230+ ~> NG, PM came to work on it
pulsator	Curling Depth	Depth 1.5	2.58
Sub Tub Assy	Suspension Status Check	Grease should not be spotted on suspension cap	OK
Tub Cover	Hook attachment	8 hooks	OK
Hub Nut	Fixing torque	1400~2200kgf	1958
Hub Nut	Depth Data and settings	Settings: 2.4\4.7	3.617
F/Panel	Gap Check	Gap: 1.1mm	OK
F/Panel	Welding	Above 10kgf	11.48 10.3 10.2 10.44 10.29
PCB	Main Version	pos2: 32 / 5.5 NH 13 / 5.5 Heater: 31 / Agitator: 9	V36
PCB	Display Version	pos2: 15 / 5.5 NH: 3 / 5.5 Heater: 14 / Agitator: 5	V15
Jet Spray	Direction	face down	OK
Bleach Cap	Gap check	Gap < 0.1mm	OK
DT Box Assy	Gap Check	Left/Right < 1mm/ Upper < 1.5mm	OK OK OK
Outer Tub	Cap	Bubble check	OK

To - Be

[Daily report, 08/31] TN Factory Top Loader Line Audit by R&D

LGEUS TN R&D Team **Eunbi Yoon** R&D Associate (eunbi1.yoon@lge.com, 1-201-816-2000) + Address book

Recipient To : H&A Quality Management Division **Lee Sujong** Vice President/Division Leader (sujong.lee@lge.com, 82-055-717-1100) and 37

This is DX activities from LGEUS R&D Team
Person in charge: LGEUS R&D Team Eunbi Yoon

Dear HA Quality Management Divison President,

I'd Like to report the Daily TN Factory Top Loader Line Audit by R&D

1. Issue Items : None

2. Daily Top Loader Line Audit Results
2-2) Sub Line(20 check points, Image 2)

3. 2nd Shift Line Audit Results
3-1) Main Line(30 check points, Image 3)
3-2) Sub Line(21 check points, Image 4)

[Image 2] Daily Audit (Sub Line)

	Items	Value 1	Value 2	Value 3	Value 4	Value 5	Judge
1	Balance welding and cap welding	OK	OK	OK	OK	OK	OK
2	Outer tub cap weld check	OK	OK	OK	OK	OK	OK
3	Light Leakage Test	OK	OK	OK	OK	OK	OK
4	Balance assy weight check	4880	4980	4926	4918	4880	OK
5	Bearing housing check	OK	OK	OK	OK	OK	OK
6	Inner Tub Assy run-out	1.3	1.4	1	1.3	1.2	OK
7	Inner Tub Weld Status	OK	OK	OK	OK	OK	OK
8	T Washer check	OK	OK	OK	OK	OK	OK
9	Rotor Nut torque check	472.8	470.5	474.2	475	470.4	OK
10	Tub cover hook attachment	OK	OK	OK	OK	OK	OK
11	Pulsator Sway Top	0.81	0.59	0.01	1.06	0.09	NG
12	Pulsator Sway Side	0.87	0.48	1.06	0.43	0.23	OK
12	Light Leakage Of Front Panel Check	OK	OK	OK	OK	OK	OK
13	Pulsator Radius	229.3	229.93	229.21	230.17	229.35	NG
14	Hub fixing nut torque	1856	1868	1854	1861	1851	OK
15	Welding between the front panel and control panel	OK	OK	OK	OK	OK	OK
16	PCB Version Check	14	14	14	14	14	NG
17	DT Box Assembled Check	OK	OK	OK	OK	OK	OK
18	Bleach Cap assembled check	OK	OK	OK	OK	OK	OK
19	Jet Nozzle Assembled Check	OK	OK	OK	OK	OK	OK
20	PCB Harness Check	OK	OK	OK	OK	OK	OK
21	Suspension Grease Status Check	OK	OK	OK	OK	OK	OK
22	Final inspection of case assembly	OK	OK	OK	OK	OK	OK

[Image 3] 2nd Shift Audit (Main Line)

	Items	Value 1	Value 2	Value 3	Value 4	Value 5	Judge
1	Lower Plate Force Check	5.7	5.4	5.3	5.9	5.4	OK
2	Upper Plate Force Check	5.3	5.8	5.8	5.9	5.2	OK
3	Upper Caulking Check (left Position)	OK	OK	OK	OK	OK	OK
4	Upper Caulking Check (right Position)	OK	OK	OK	OK	OK	OK
5	Lower Caulking Check (left Position)	OK	OK	OK	OK	OK	OK
6	Lower Caulking Check (right Position)	OK	OK	OK	OK	OK	OK
7	Base Leg Gap Check	OK	OK	OK	OK	OK	OK
8	Base Screw Qty Check	OK	OK	OK	OK	OK	OK
9	Damper To Top Of Cabinet Distance Check	OK	OK	OK	OK	OK	OK
10	Drain Pump Harness Check	OK	OK	OK	OK	OK	OK
11	Drain Hose Installation Check	OK	OK	OK	OK	OK	OK
12	Drain Hose Bellows Bond Application Check	OK	OK	OK	OK	OK	OK
13	Tub Bellows Groove With Drain Pump	OK	OK	OK	OK	OK	OK
14	Multi-harness Connection Check	OK	OK	OK	OK	OK	OK
15	Distance Between Wire-tie and Cabinet	22.86	20.84	20.45	21.82	21.37	OK
16	Top Cover Screw Installation Check	OK	OK	OK	OK	OK	OK
17	Drain Hose Holder Screw Installation Check	OK	OK	OK	OK	OK	OK
18	Ground Wire Screw Gap Check	OK	OK	OK	OK	OK	OK
19	Pressure Tube Clamp To Outer Tub Distance Check	0.02	0.05	0.05	0.07	0.04	OK
20	Pressure Tube Clamp To Outer Tub Distance	6.2	5.27	5.53	5.63	5.39	OK
21	Suspension Grease Application Check	OK	OK	OK	OK	OK	OK
22	Suspension Greease Distance	4.5	4.1	4.7	4.2	4.2	OK
23	Rear Cover Screw Installation Gap Check	OK	OK	OK	OK	OK	OK
24	Base Packing Correct Usage	OK	OK	OK	OK	OK	OK
25	Light Leakage On Top Cover Check	OK	OK	OK	OK	OK	OK
26	Energy Label Matching With Model	OK	OK	OK	OK	OK	OK
27	Rating Label Matching With Model	OK	OK	OK	OK	OK	OK
28	Year Label Attachment Check	OK	OK	OK	OK	OK	OK
29	Top Cover Gap Check(Left)	1.75	1.79	1.68	1.75	1.72	OK
30	Hinge Installation Check	1.6	1.2	1	1.3	1.1	OK

[Image 4] 2nd Shift Audit (Sub Line)

	Items	Value 1	Value 2	Value 3	Value 4	Value 5	Judge
1	Balance Welding Jig Cleaning Check	OK	OK	OK	OK	OK	OK
2	Balance Part Weight Check	2082	2104	2108	2080	2090	OK
3	Balance Inner Weight Check	1450	1448	1451	1479	1469	OK
4	Balance Outer Weight Check	1399	1396	1419	1391	1399	OK
5	Balance Total Weight Check	4968	4899	4907	4964	4890	OK
6	Balance Weld Height Check	2.31	2.45	2.43	2.33	2.35	OK
7	Inner Tub Frame Out Beading Width Check	OK	OK	OK	OK	OK	OK
8	Bearing Housing T Washer Applied Check	OK	OK	OK	OK	OK	OK
9	Drain Pump Bellows Installation Check	OK	OK	OK	OK	OK	OK
10	Pulsator Curling Depth Check	1.79	1.69	1.77	1.63	1.67	OK
11	Suspension Status Check	OK	OK	OK	OK	OK	OK
12	Tub Cover Hook Attachment	OK	OK	OK	OK	OK	OK
13	Front Panel Gap Check	0.65	0.65	0.6	0.65	0.7	OK
14	Front Panel Welding Check	10.5	10.39	10.42	10.65	10.27	OK
15	Jet Spray Direction Check	OK	OK	OK	OK	OK	OK
16	Bleach Gap Check	0.5	0.6	0.5	0.6	0.65	OK
17	DT Box Gap Check(Left)	0.7	0.6	0.65	0.7	0.65	OK
18	DT Box Gap (Right)	0.6	0.7	0.7	0.85	0.6	OK
19	DT Box Gap(Upper)	1	1	1.2	1	1.2	OK
20	Outer Tub Cap Bubble Check	OK	OK	OK	OK	OK	OK
21	Pressure Tube Blocking Check	OK	OK	OK	OK	OK	OK

2. Automatic GMES Line Audit System

As - Is

[Daily report, 8/05] TN Factory Front Load Line Audit by R&D

LGEUS TN R&D Team **Russell Wilson** R&D Engineer (russell.wilson@lge.com, 1-201-816-2000) + Address book

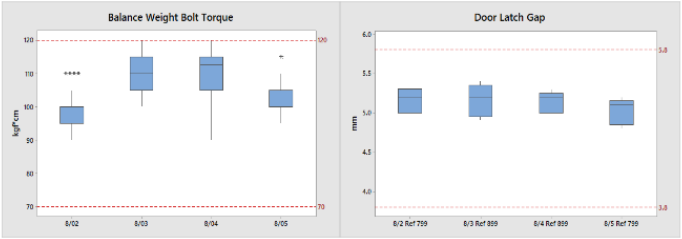
Recipient To : H&A Quality Management Division **Lee Sujong** Vice President/Division Leader (sujong.lee@lge.com, 82-055-717-1100) and 36

Dear HA Quality Management Division President,

I'd like to report the Daily TN Factory Front Loader Line Audit by R&D

1. Issue items: None
2. Balance Weight Bolt Torque and Door Latch Gap Measurements (Image 1)
3. Daily Front Loader Audit results (Image 2 : Daily Audit results)

[Image 1] Boxplot on Balance Weight Bolt Torque and Door Latch Gap



		2-Aug	3-Aug	4-Aug	5-Aug
Balance Weight Torque	Minimum	90	100	90	95
	Maximum	110	120	120	115
	Mean	98.83	109.5	109.5	103.5

		2-Aug	3-Aug	4-Aug	5-Aug
Door Latch Gap	Minimum	5	4.9	5	4.8
	Maximum	5.3	5.4	5.3	5.2
	Mean	5.16	5.16	5.14	5.02

[Image 2] Daily Audit Result (Cycle through three checklists. The combine checklists, include all 26 checkpoints.)

To - Be

[Daily report, 08/27] TN Factory Front Load Line Audit by R&D

LGEUS TN R&D Team **Russell Wilson** R&D Engineer (russell.wilson@lge.com, 1-201-816-2000) + Address book

Recipient To : H&A Quality Management Division **Lee Sujong** Vice President/Division Leader (sujong.lee@lge.com, 82-055-717-1100) and 37

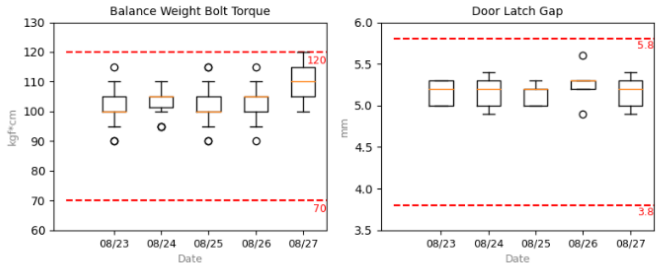
This is DX activities from LGEUS R&D Team
Person in charge: LGEUS R&D Team Eunbi Yoon

Dear HA Quality Management Divison President,

I'd Like to report the Daily TN Factory Front Loader Line Audit by R&D

1. Issue Items : None
2. Balance Weight Bolt Torque and Door Latch Gap Measurements (Image 1)
3. Daily Front Loader Line Audit Results (Image 2)

[Image 1] Boxplot on Balance Weight Bolt Torque and Door Latch Gap



Balance Weight Bolt Torque Result

	08/23	08/24	08/25	08/26	08/27
Maximum	115.0	110.0	115.0	115.0	120.0
Minimum	90.0	95.0	90.0	90.0	100.0
Average	102.17	104.33	102.0	103.0	109.23

Door Latch Gap Result

	08/23	08/24	08/25	08/26	08/27
Maximum	5.3	5.4	5.3	5.6	5.4
Minimum	5.0	4.9	5.0	4.9	4.9
Average	5.16	5.16	5.14	5.26	5.16

[Image 2] Daily Audit Result (Cycle through two checklists. The combine checklists, include all 26 checkpoints.)

Front Loader Line Audit Result (08/27)

	Items	Value 1	Value 2	Value 3	Value 4	Value 5	Judge
1	Balance Weight Bolt Torque	115	115	115	110	105	OK
2	Door Latch Gap	5.4	5	4.9	5.3	5.2	OK
3	Owner's Manual Version Check	OK	OK	OK	OK	OK	OK
4	Energy Label Version Check	OK	OK	OK	OK	OK	OK
5	M Lower Caulking Check (left Position)	1.2	1.4	1.8	1.2	2	NG
5	PCB Cover Tightened Check	OK	OK	OK	OK	OK	OK
6	Drain Pump Bellows Tightened Check	OK	OK	OK	OK	OK	OK
7	Drain Pump Harness Connected Check	OK	OK	OK	OK	OK	OK
8	Drain Hose Damaged Check	OK	OK	OK	OK	OK	OK
9	Door Hinge Tightened Check	OK	OK	OK	OK	OK	OK
10	Inner Door And Outer Door Assembled Check	OK	OK	OK	OK	OK	OK
11	Glass And Outer Door Step Check	OK	OK	OK	OK	OK	OK
12	Door Sealant Application Check	OK	OK	OK	OK	OK	OK
13	Dispenser Bellows Tightened Check	OK	OK	OK	OK	OK	OK
14	Protected Sticker Check	OK	OK	OK	OK	OK	OK
15	Cabinet Cover Side Gasket Tightened Check	OK	OK	OK	OK	OK	OK
16	Tub Side Air Vent Bellows Tightened Check	OK	OK	OK	OK	OK	OK

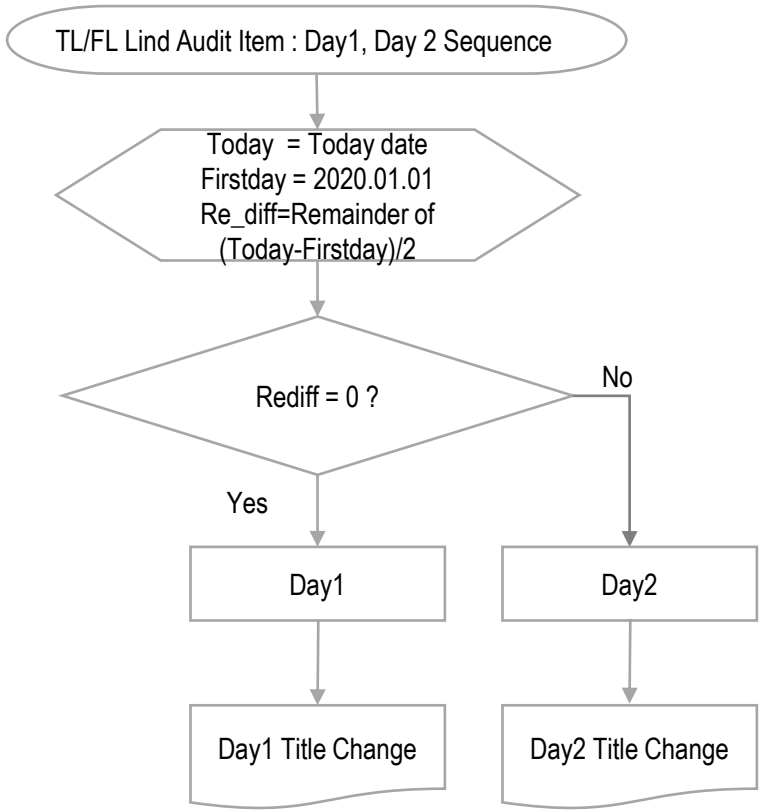
2. Automatic GMES Line Audit System_TL/FL Line Audit Day Sequence

Modeling

Start at 2020.01.01. That date was day1, and 2020.01.01-2020.01.01=0

Monday	Tuesday	Wednesday	Thurday	Friday	Saturday	Sunday
i	i+1	i+2	i+3	i+4	i+5	i+6
i+7	i+8	i+9	i+10	i+11	i+12	i+13
i+14	i+15	i+16	i+17	i+18	i+19	i+20
i+21	i+22	i+23	i+24	i+25	i+26	i+27
i+28	i+29	i+30	i+31			

Logic Tree



Build Code

```
Today=datetime.datetime.now()
Firstday=datetime.datetime.strptime("20200101", "%Y%m%d")
Re_diff,numpy=divmod(2,(Today - Firstday).days)

if Re_diff==0:
    ax0.annotate('[Image 1] Daily Audit (Main Line)',xy=(0,1),color='#515C5A',fontsize=10)
else:
    ax0.annotate('[Image 1] Daily Audit (Sub Line)',xy=(0,1),color='#515C5A',fontsize=10)
```

3. Product Defect Analyze System – Q Bank Activities

1) Daily PPM

1. Q- Bank Item Daily PPM Monitoring

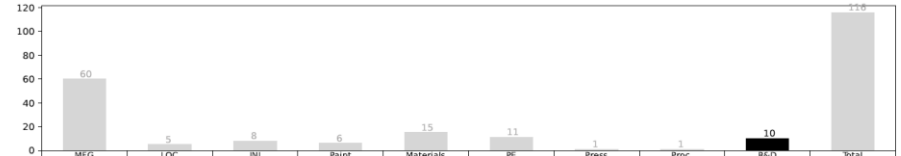
	Q Bank Item	T/C	Qbank Defect Qty	Qbank Base Defect Rate	Judgment Criteria	Qbank Target Defect Rate	W39	W40	W41	W42	W43	W44	W45
F/L	Cabinet Cover Gap	R&D	138	1441	476	432	104	0	113	0	0	0	311
F/L	Noise test – no issue	R&D	98	1024	338	307	1038	7193	1691	2108	1878	499	1399
F/L	UE Error retest – no issue	R&D	74	773	255	232	311	0	338	243	94	249	0
F/L	Control Panel Gap	R&D	56	585	193	175	0	180	225	324	0	415	311
F/L	Rotor noise test – no issue	R&D	40	418	138	125	200	0	0	81	94	166	155
F/L	Bellows leakage retest – no issue	R&D	19	198	65	60	0	360	0	162	94	166	155
T/L	Motor noise retest – no issue	R&D	483	3764	1242	1129	3612	3583	2101	2089	1604	4158	3209
T/L	Top Cover Gap	R&D	56	436	144	131	650	312	467	914	279	66	370
T/L	PCB Touch Button	R&D	133	1037	342	311	939	234	467	65	0	264	0
T/L	Bad Spin Inner Tub	R&D	28	218	72	65	289	156	700	261	349	462	617

2) Q-Bank Activities Progress

3. Q-Bank items detailed review by R&D Team

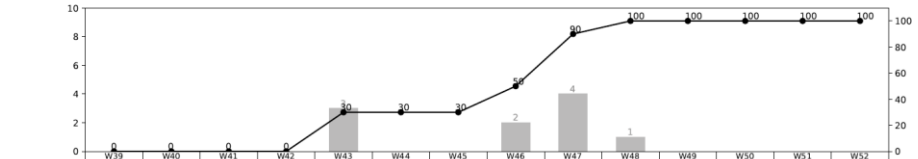
	Registration	Production	Issue	Improvement Action	Current	Current Defect (PPM)	Improvement Target	Improvement Rate	Target Date	PIC
F/L	9/27	FL Victor2	WM01	Cabinet cover Gap	Assembly and Structure improvement	1441	432	70%	10/29	Aaron
F/L	9/28	FL Victor2	WM01	Noise test – no issue	Process improvement	1024	307	70%	11/26	Min
F/L	9/29	FL Victor2	WM01	UE Error retest – no issue	Process improvement	773	232	70%	11/15	Russell
F/L	9/30	FL Victor2	WM01	Control panel Gap	Assembly and Structure improvement	585	175	70%	11/30	Aaron
F/L	9/31	FL Victor2	WM01	Rotor noise test – no issue	Process improvement	418	125	70%	11/26	Min
F/L	9/32	FL Victor2	WM01	Bellows leakage retest- no issue	Process improvement	198	60	70%	11/15	Russell
T/L	9/33	TL TD	WM02	Motor noise retest – no issue	Process improvement	436	131	70%	11/26	Eunbi
T/L	9/34	TL TD	WM02	Top cover Gap	Assembly and Structure improvement	3764	1129	70%	10/29	Peter
T/L	9/35	TL TD	WM02	PCB Touch button	Process improvement	35688	10706	70%	11/26	Matthew
T/L	9/36	TL TD	WM02	Bad Spin Inner tub	Equipment and Structure improvement	218	65	70%	10/29	Peter

2. Q-Bank 2 : Registration Item (Total 116 Items)



	MFG	LQC	INJ	Paint	Materials	PE	Press	Proc.	R&D	Total
Q Bank Items	60	5	8	6	15	11	1	1	10	116
Portion	52%	4%	7%	5%	13%	9%	1%	1%	8%	100%

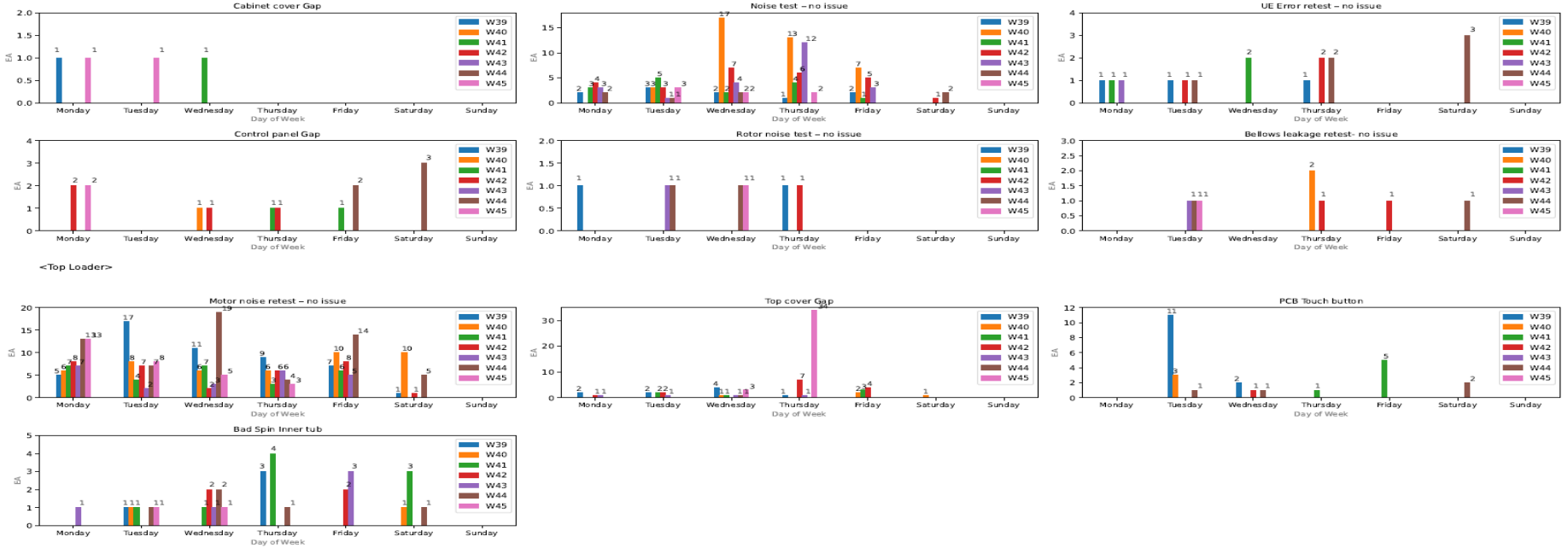
4. Q-Bank kick off by R&D Team



	W39	W40	W41	W42	W43	W44	W45	W46	W47	W48	W49	W50	W51	W52
Applied Plan	0	0	0	0	3	0	0	2	4	1	0	0	0	0
Completed Plan	0	0	0	0	3	3	3	5	9	10	10	10	10	10
Completed Rate	0	0	0	0	30	30	30	50	90	100	100	100	100	100

3) Daily Defect Qty

3. Daily LQC Defect History
<Front Loader>



3. Product Defect Analyze System – Graph Arrangement

Modeling

Graph

0	1	2	3	4	5	6	7	8	9

Matrix

0	1	2
3	4	5
6	7	8
9	-	-

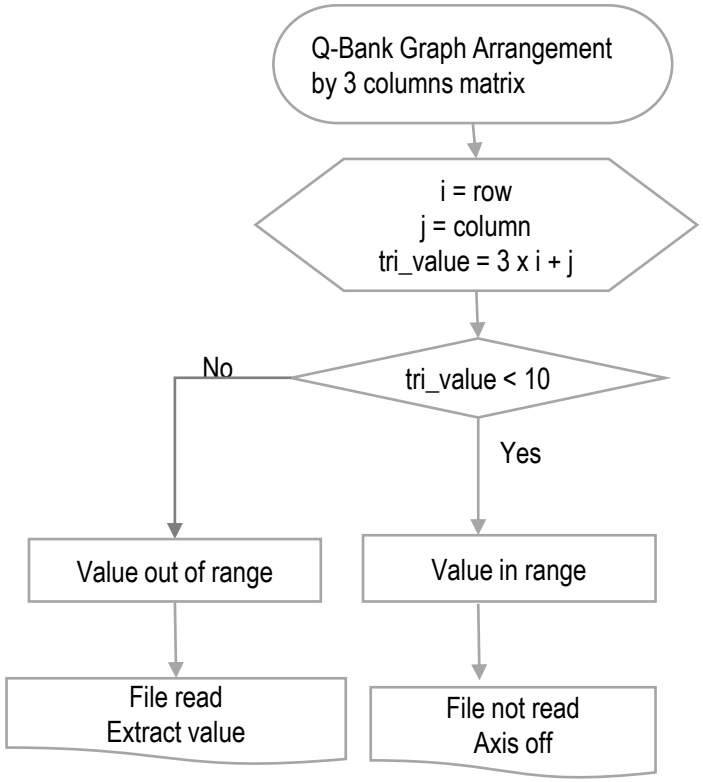
Arrange

00	01	02
10	11	12
20	21	22
30		

Ternary

0x3+0=0	0x3+1=1	0x3+2=2
1x3+0=3	1x3+1=4	1x3+2=5
2x3+0=6	2x3+1=7	2x3+2=8
3x3+0=9	-	-

Logic Tree



Build Code

```
for i in range(4):
    for j in range(3):
        tri_value=3*i+j
        if tri_value<10:
            data=pd.read_excel('//us-so11-na08765/R&D Secrets/Q-bank/Daily Report/PGM
              File2.xlsx',sheet_name=str(tri_value))
            data=data.T
            print(data)
            data.columns=['W39','W40','W41','W42','W43','W44','W45','W46']
            print(data)
            data=data.drop(['NAME'],axis=0)
            print(data)
            data=data.apply(pd.to_numeric)
            print(data)
            data.plot(kind='bar',ax=ax[i,j])

ax[i,j].set_xticklabels(labels=['Monday','Tuesday','Wednesday','Thursday','Friday','Saturday','Sunday'],rotation=0,fo
ntsize=9)
            ax[i,j].set_ylim(0,data.max().max()+2)
            ax[i,j].set_ylabel('EA',color='gray',fontsize=9)
            ax[i,j].set_xlabel('Day of Week',color='gray',fontsize=9)
            ax[i,j].legend(loc='upper right')
            ax[i,j].set_title(Title.at[i,j],fontsize=10,loc='left')

            data=data.reset_index(drop=True)
            data=data.T
            data=data.fillna(0)
            data=data.reset_index(drop=True)
            data=data.T

            for t in range(len(data.index)):
                for k in range(len(data.columns)):
                    if int(data.at[t,k])>0:
                        ax[i,j].annotate(int(data.at[t,k]),xy=(t-0.09*(3.1
                          k),data.at[t,k]+0.12),ha='left',va='bottom',fontsize=9)

ax[3,1].set_axis_off()
ax[3,2].set_axis_off()
```