



Waters

Quarterly Business Review

20 May 2020

Agenda

- Account Highlights
- Key Metrics
- Quality
- Continuous Improvement
- Supply Chain
- Wrap Up

Account Highlights

Accomplishments

● Awarded Arc SM FTN product

- New product family win for Flex with US\$5M revenue.
- Project kick off done with team formation in Mar'20, with first units from Flex planned in end Nov 2020.

● Quality

- Yield met 85.7% against the target 84.8% in Q1'20.
- Completed “Dock To Stock”- Waters & Flex joint quality improvement project. 313 parts moved from 100% inspection to DTS.
- Established Day1 failure and hot part failure analysis process, completing the FA process for 12 parts.

● OTD

- Met 98.93% OTD performance in Q1'20.
- Mitigated challenges in Q1'20 despite the COVID-19 situation and met Waters requirement for Q1'20.

Accomplishments

● Supply Chain

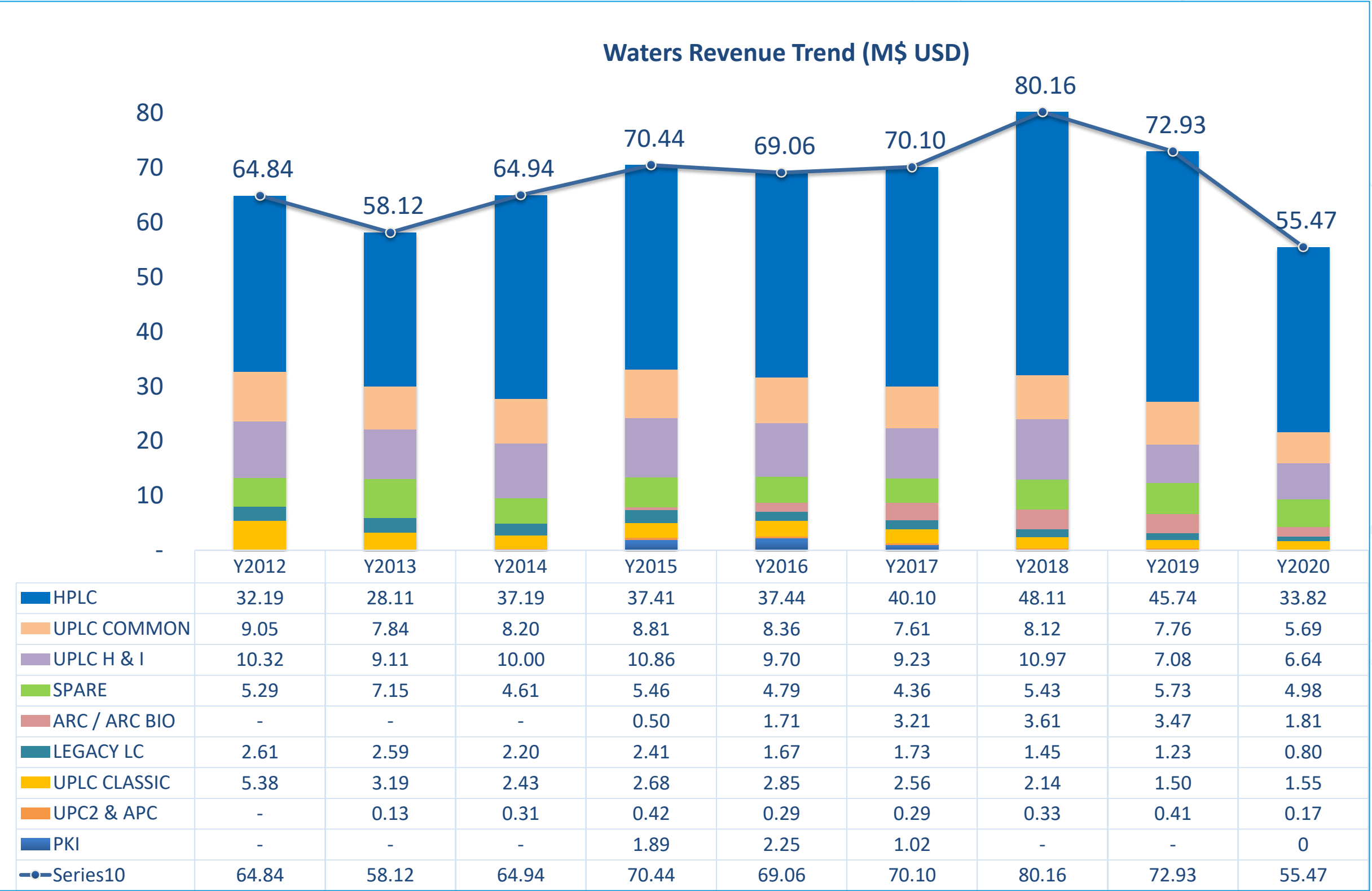
- Met 100% CTB for Q1 production plan despite numerous supply chain challenges due to the COVID-19
- Materials team demonstrated excellent support on materials expedite. Joint effort with Waters Singapore and Flex for shortage material follow up include daily call, part allocation even expedite new supplier transducer qualification.

● Operations

- Successfully completed the setup and validation for the new (4th) Pump Tray Tester. Upgraded and validated existing 3 testers. (improved the capacity 20% from 30u/Day to 40u/Day.)
- Operator Re-certification & Competency check for Pumps completed.
- eDHR Go Live for BSM/QSM Family. Good collaboration with Flex and Waters team on completion of review and validation activity for eDHR for BSM & QSM Plus.
- Kicked off yield improvement project with Waters team to reduce the soft failure (Loss comm & Dual Noise for Detectors). Completed identification of 4M actions with monitoring in progress.
- Go live on automated serial number traceability to PO to include product SN on the packing list.

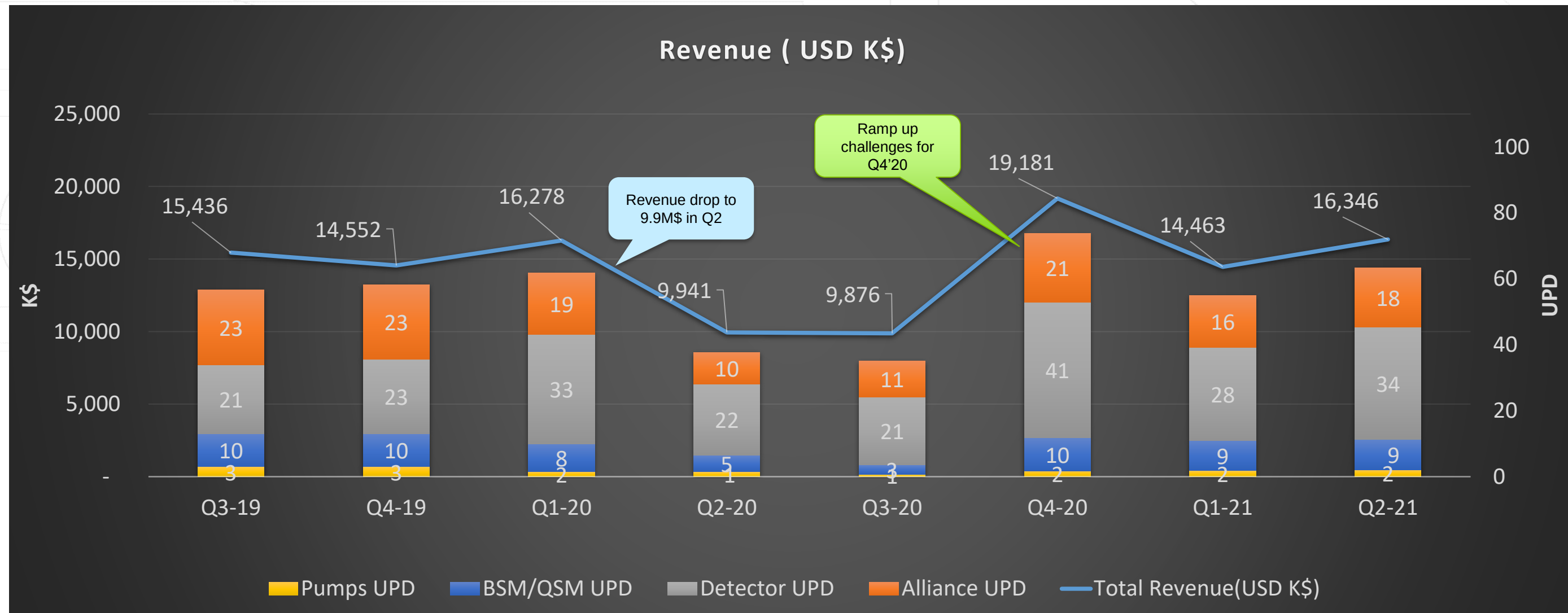
Key Metrics Update

Annual Revenue Trend



- 2020 revenue projected at 55.47M\$.
- Forecast drop of 17.36M\$ for current year.

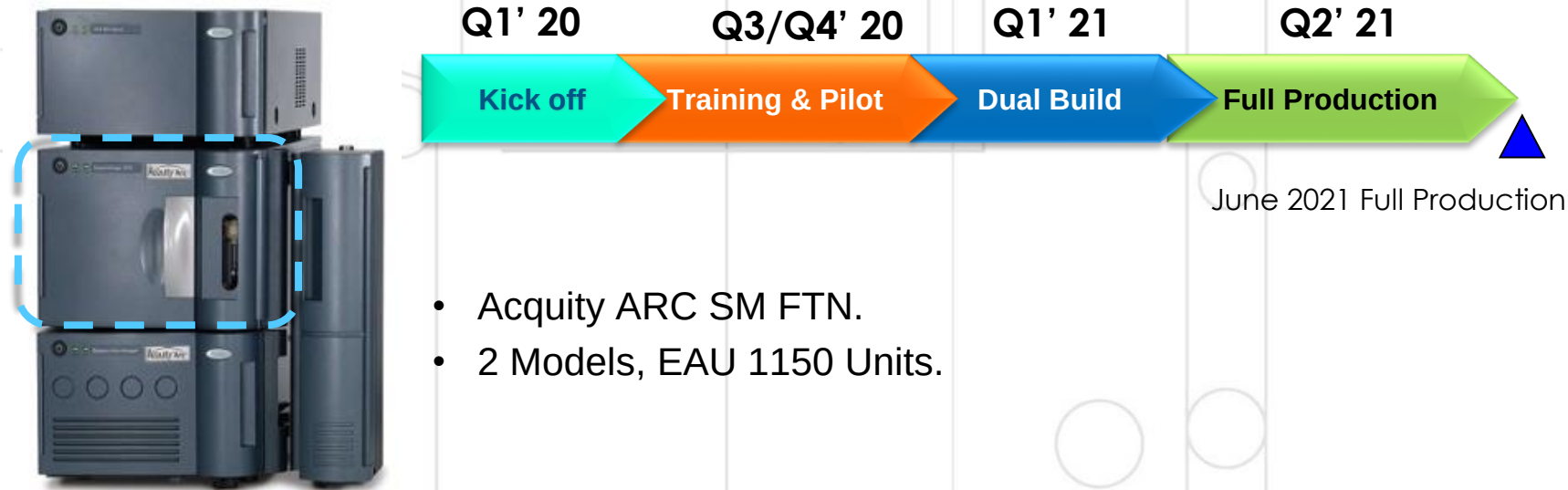
Quarterly Revenue Trend



- Mitigation in progress related to challenges on supply chain and operations after demand drop in 2020.
- Q2&Q3 CY20 forecast instrument & spares maintained at 9.8M\$.
- Q4CY20 forecast at 19.1M\$ to be reviewed to ramp capacity in Q3 for Q4 volume.

Acquity ARC SM FTN Product Transfer

Project & Transfer Timeline



Major Milestones

Transfer Phases	Q1'20	Q2'20	Q3'20	Q4'20	Q1'21	Q2'21
Project award	Mar'20					
Program Kick Off	Mar'20					
Project Input		Apr'20				
Commercial Release		May'20				
Material Localization			Aug'20	Oct'20		
Material Readiness			Aug'20	Dec'20		
Manufacturing Readiness		Jun'20		Nov'20		
Consigned Build and Approval			Aug'20	Dec'20		
Production Launch / Ramp				Oct'20		Jun'21

● Complete
 ● In Progress
 ● Extend Time
 ● Plan

Overall Status Summary

- ✓ Project team and detailed Project Gantt chart
- ✓ Project input from Waters received (ASP/TSP/Tooling/BOM/AVL/ flowchart etc.)
- ✓ System setup and review completed (FlexQ, Agile, Baan, BOM, TSP)
- ✓ IDM list reviewed and RFQ done
- ✓ Standard tooling and Workstation setup (PC/ Scanner) ordered
- ✓ First Article roadmap shared with Waters

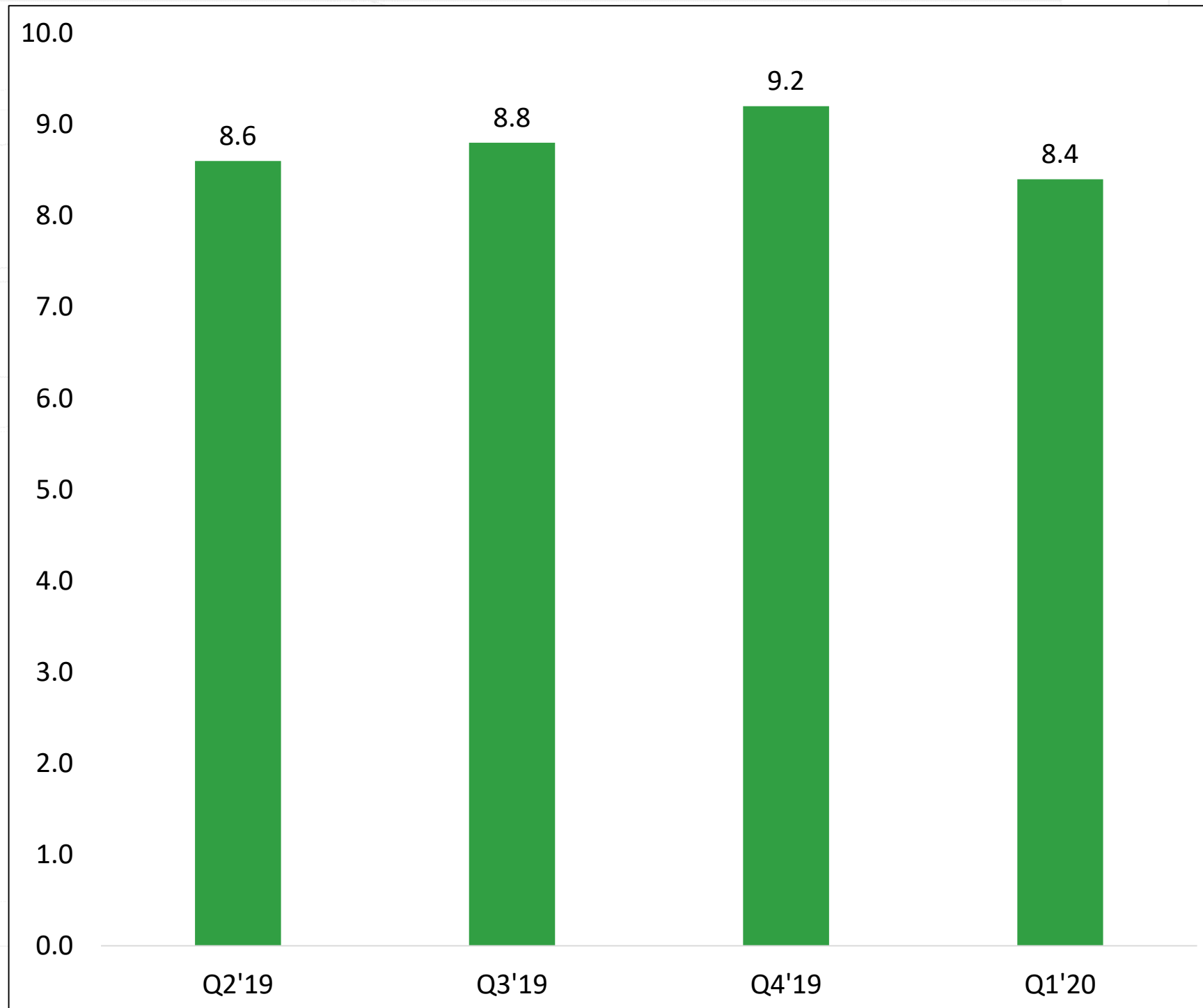
Next Steps

- First Article of localization parts
- BOM change review and quote refresh.
- Material NRE PO in progress
- ASP Review completed and pending Flex Q update
- PFMEA and flowchart in progress
- eDHR requirement
- Line layout review in progress

Key Challenges

- Training schedule (Sep-Oct'20)
- Consign tester and customize tools/fixture delivery (Nov'20)

Customer Satisfaction Management Program



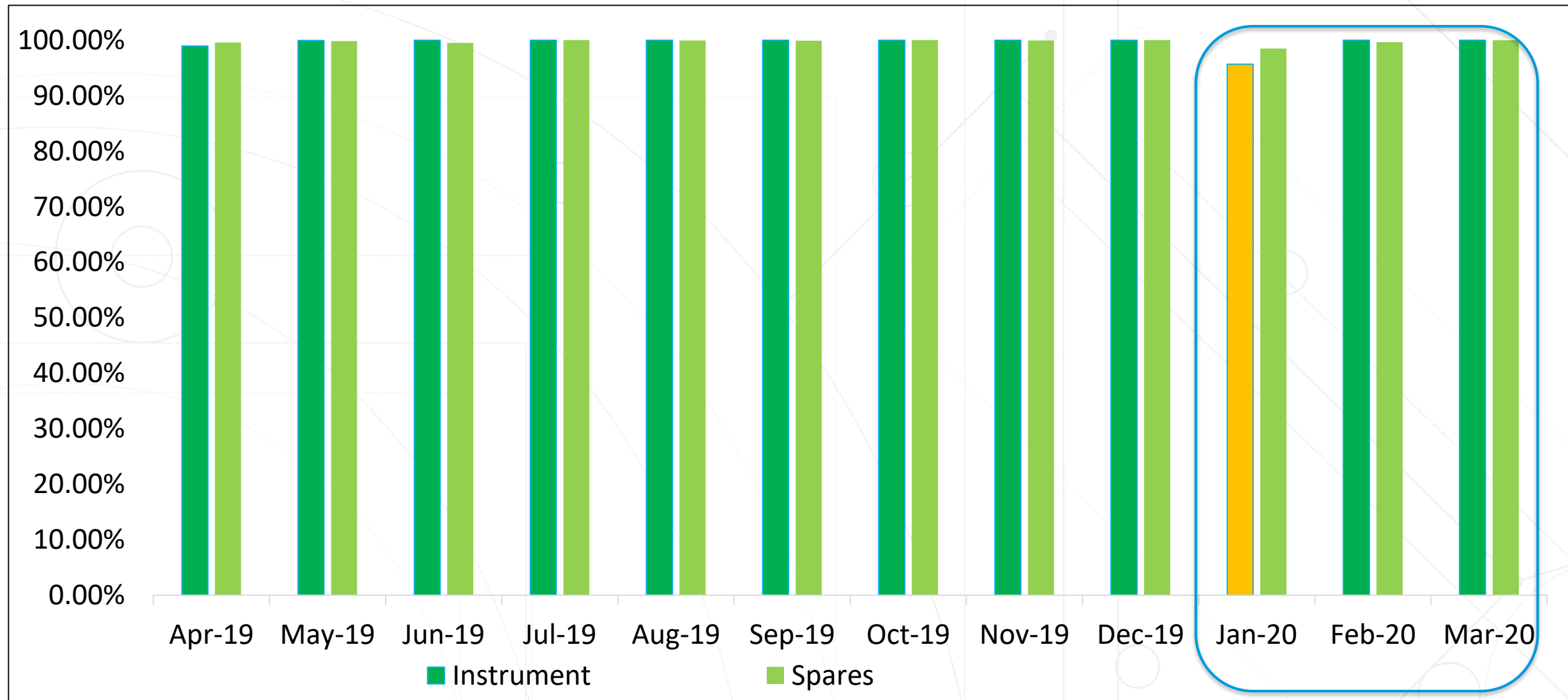
Highlights in Q1'20

- ✓ Flex met FPY target in Q1 2020.
- ✓ No SCAR in Q1'20
- ✓ ECO met target TAT 9days in Q1'20.
- ✓ New OESR, tester downtime and tooling PM report were reported timely.
- ✓ Validations executed per plan.
- ✓ Implemented new evaluation form immediately.
- ✓ Good support to adhoc requests.
- ✓ Flex has also been supportive of the weekly spares reschedule request from Waters and provided prompt updates to the requests
- ✓ CTB 100% to met shipment despite numerous supply chain issue due to the COVID-19.

Lowlights in Q1'20

- ✓ OTD Instrument 98.2%
- ✓ GPV failure reporting and additional verification.

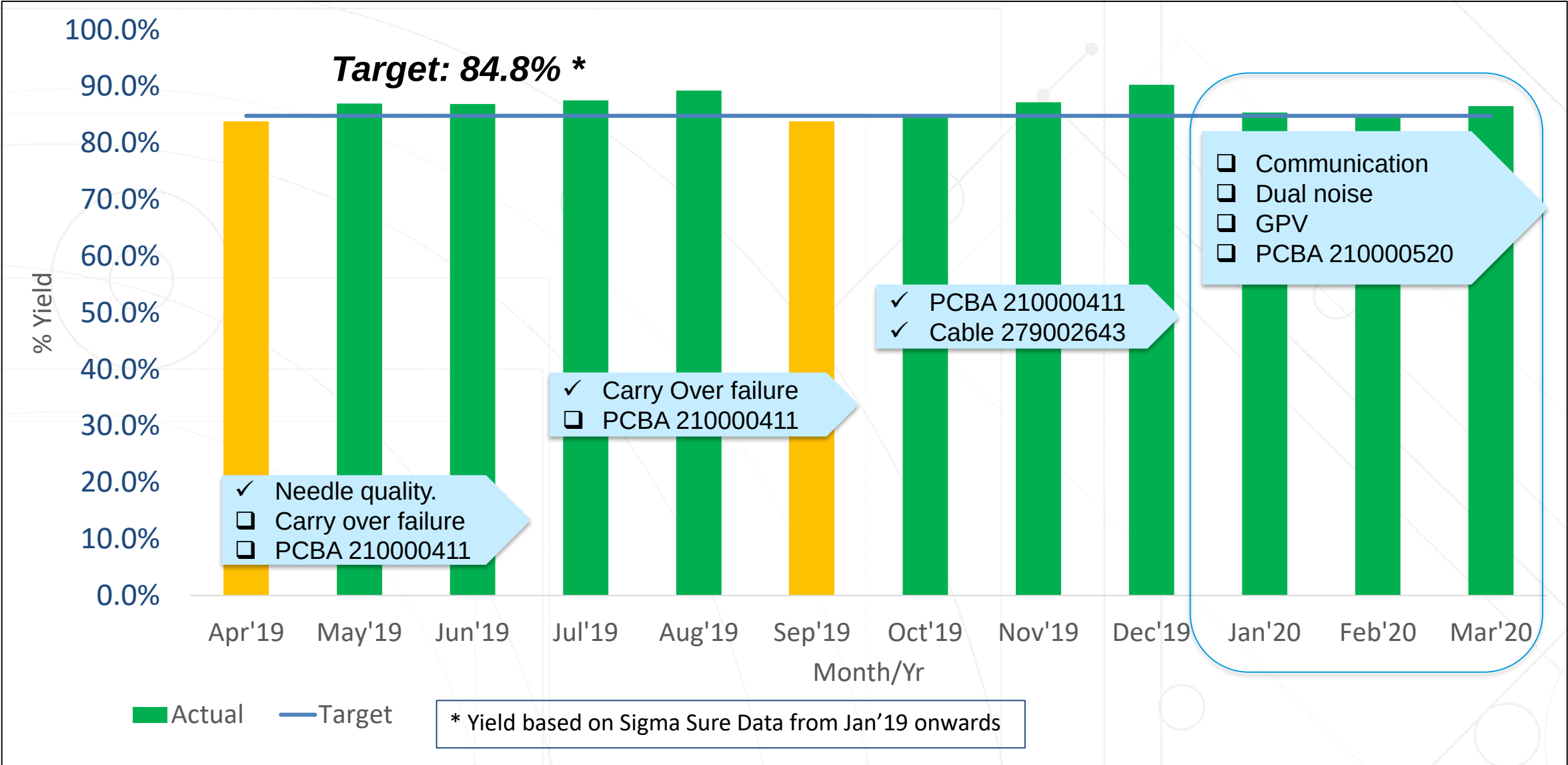
On Time Delivery



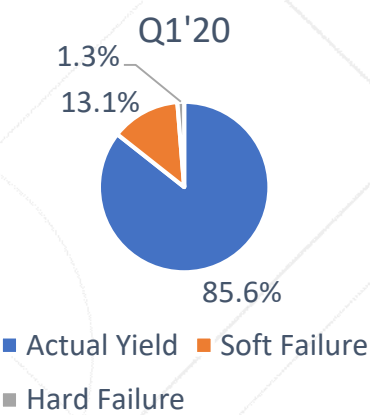
- Met 98.55% OTD for instruments and 99.31% for spares for Q1'20
- OTD issue in Jan is due to material purge and HC challenges post new year.
- Delivered all the numbers for Q1'20 despite the COVID-19 issue
- Mitigated all supply chain and quality challenges with close collaboration with WPPL, especially due to China and Malaysia lockdown.

Period	Apr'19	May'19	Jun'19	Jul'19	Aug'19	Sep'19	Oct'19	Nov'19	Dec'19	Jan'20	Feb'20	Mar'20
Instrument	98.95%	99.95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	95.65%	100.00%	100.00%
Spare	99.57%	99.81%	99.48%	100.00%	99.94%	99.89%	100.00%	99.92%	100.00%	98.41%	99.58%	99.94%

First Pass Yield

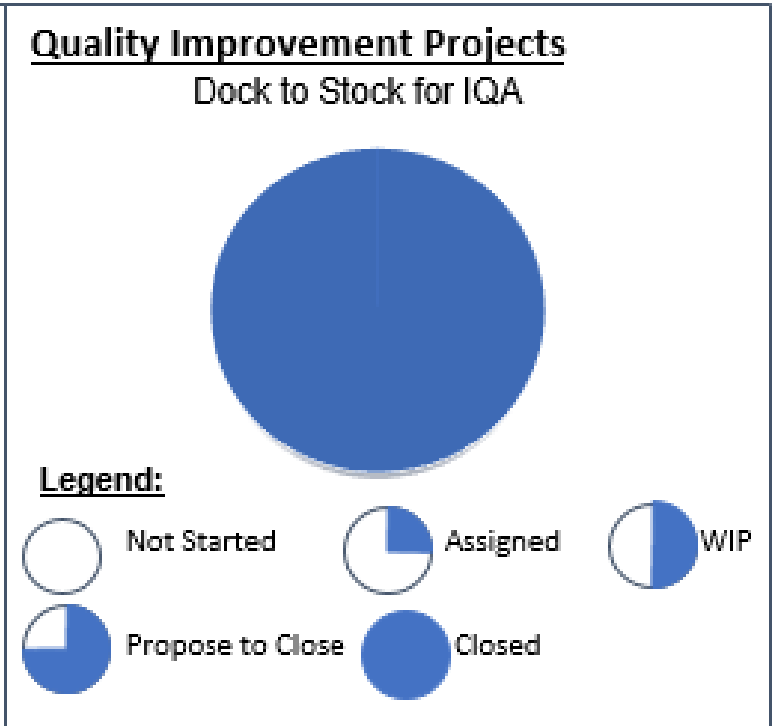
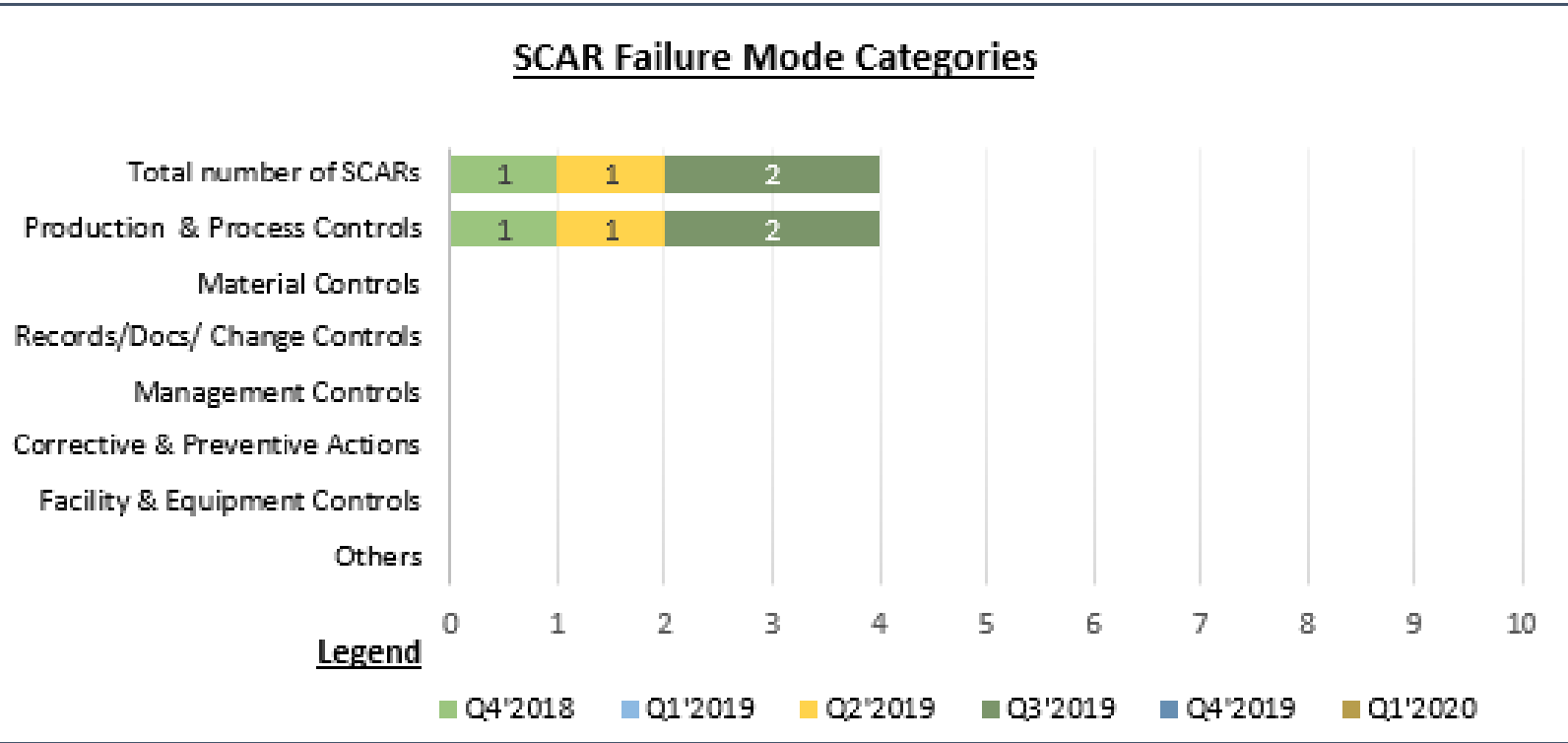
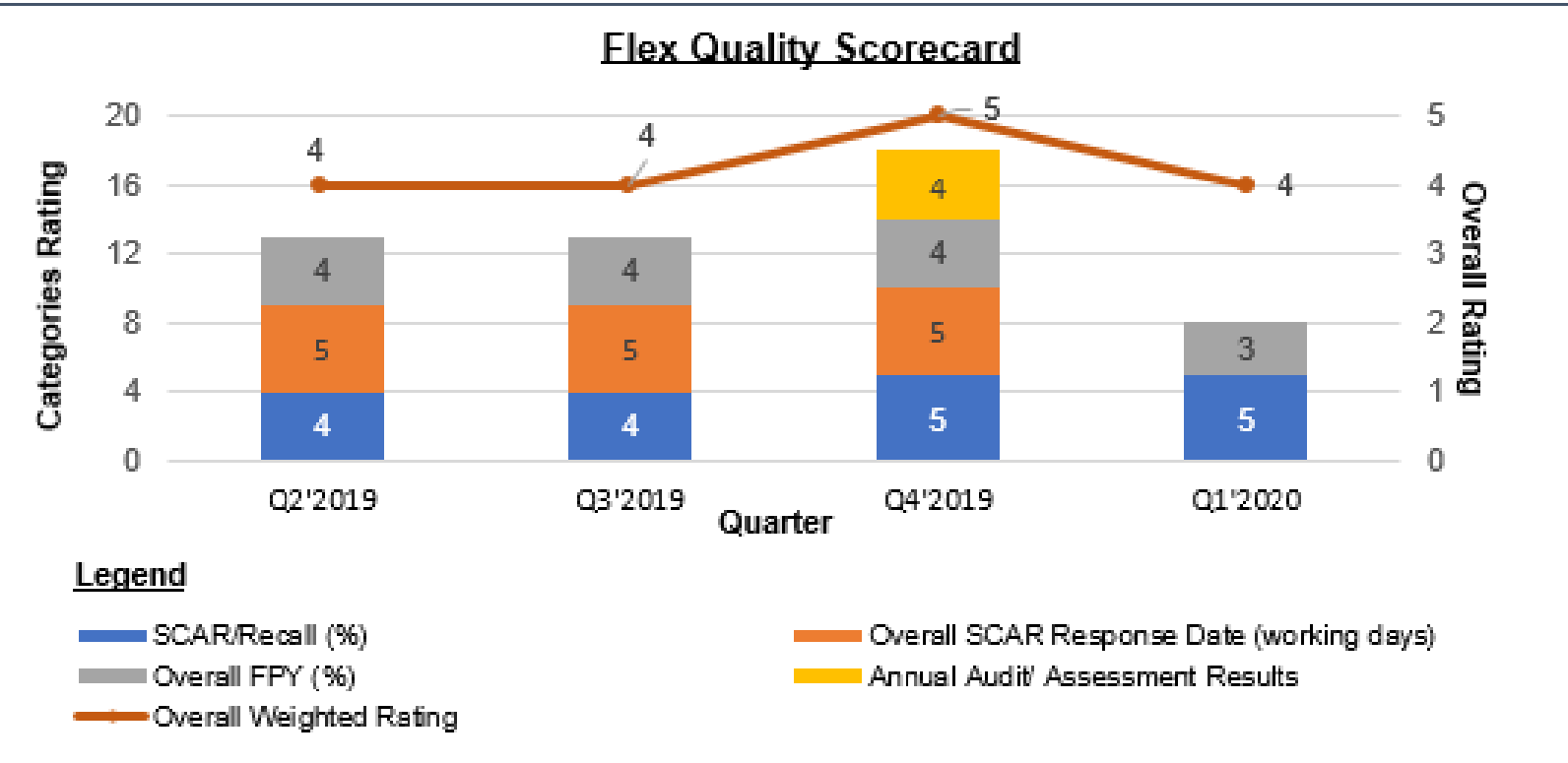


- Overall FPY% of 85.7% for Q1'20 against target 84.8%
- Yield improvement projects in area of soft failure for dual noise and loss communication. Action are in progress.
- PCBA 210000520, supplier CEI implemented the offline screen early Jan. Monitoring in progress.
- GPV Failure, Joint investigation in progress.



Period	Apr'19	May'19	Jun'19	Jul'19	Aug'19	Sep'19	Oct'19	Nov'19	Dec'19	Jan'20	Feb'20	Mar'20
Target	84.8%	84.8%	84.8%	84.8%	84.8%	84.8%	84.8%	84.8%	84.8%	84.8%	84.8%	84.8%
Actual	83.7%	87.0%	86.9%	87.5%	89.3%	83.7%	84.8%	87.2%	90.3%	85.4%	85.0%	86.5%

Quality Dashboard



Open SCARs

No Open SCARs

Open Audit NCs

2 Audit SCAR Closed

- Overall score for Q1'20 is 4.
- DTS project approved in Mar and 313 parts move to DTS and implemented in Apr.
- 2 Audit NC Closed.
- No SCAR in Q1'20

* Q1'20 established score card new methodology.

Quality Update

Summary - CAPA

Closed
 Open

Product Family	Apr '19	May' 19	Jun' 19	Jul' 19	Aug' 19	Sep' 19	Oct' 19	Nov' 19	Dec' 19	Jan' 20	Feb' 20	Mar' 20	Total	Remarks
Alliance	-	1	-	-	-	-	-	-	-	-	-	-	1	CAR 19-008: May'19 - Alliance Needle hole misalignment - Closed
Detector	-	-	-	-	-	-	-	-	-	-	-	-	0	NA
Solvent Manager	-	-	-	-	-	-	-	-	-	-	-	-	0	NA
PUMP	-	-	-	-	-	-	-	-	-	-	-	-	0	NA
Spares	-	-	-	-	-	2	-	-	-	-	-	-	2	SCAR-SG 190902: Sep'19 – wrong Qty on outer box for 700012244.- Closed SCAR-SG 190903: Sep'19 – wrong COO on outer box for WAS207106. Closed

- Q2'19: 1 CAPA received (Closed)
- Q3'19: 2 CAPA received (all Closed)
- Q4'19: No CAPA received
- Q1'20: No CAPA received

Summary – Field Feedback



Closed



Open

Product Family	Apr' 19	May' 19	Jun' 19	Jul' 19	Aug' 19	Sep' 19	Oct' 19	Nov' 19	Dec' 19	Jan' 20	Feb' 20	Mar' 20	Total	Remarks
Alliance	-	1	-	-	-	-	-	-	-	3	-	-	4	May'19 - Alliance Needle hole misalignment – Closed Jan'20 - one PCBA 210000425 found with bad soldering on VR4 and C157 (Alliance SN:F19SM7500A, 210000425 SN:140519120M) – Closed Jan'20 - Alliance SN M18SM4184A was found to have needle malfunction error. The FSE found red/white wire had come out of the motor 279000928 Molex connector. – Closed Jan'20 - Alliance unit SN K19SM4617A was found to have missing outlet ferrule fitting at customer lab in China. – Closed
Detector	-	-	-	-	1	-	-	-	-	-	-	-	1	Aug'19 – missing LUG in startup kit – Closed
Solvent Manager	-	-	-	-	-	-	-	-	-	-	-	-	0	NA
PUMP	-	-	-	-	-	-	-	-	-	-	-	-	0	NA
Spares	-	-	-	-	-	-	-	-	-	-	-	-	0	NA

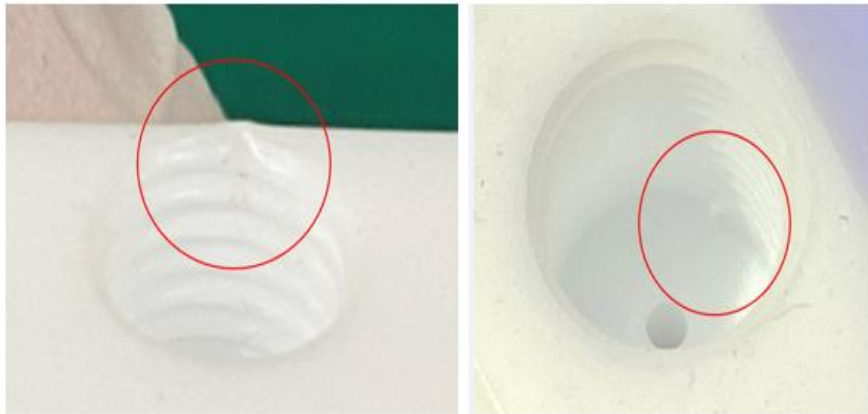
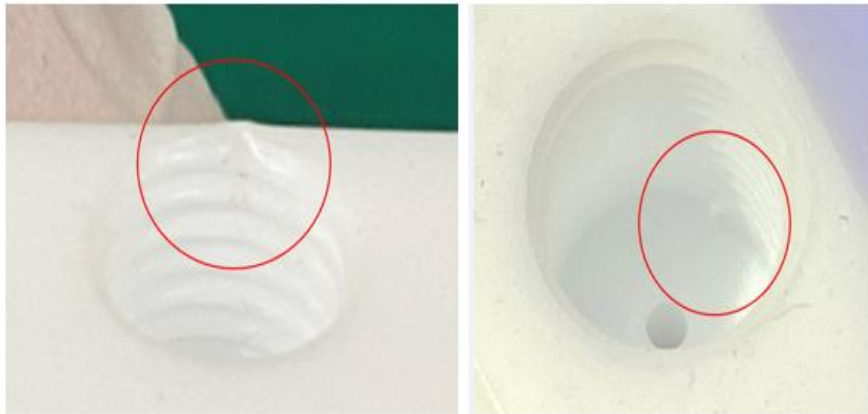
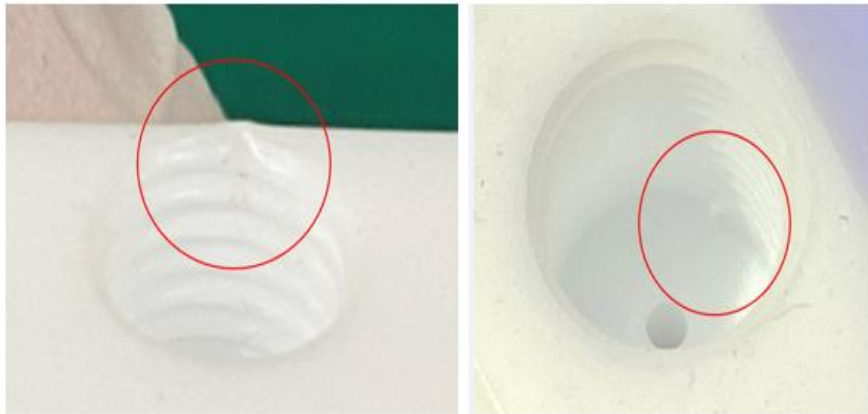
- Q2'19: 1 Field feedback received (Closed)
- Q3'19: 1 Field feedback received (Closed)
- Q4'19: No Field feedback received
- Q1'20: 3 Field feedback received (Closed)

Day1 and Hot Part FA status (Dec'19 to May'20)

Hot/Day1 Part	Part Number	Reported failure	NTF	Fail	No FA Required	FA in-progress	Total	Remarks
Hot Part (Total 9)	700001031 (Torpedo)	1-Noise from the accumulator pump. Liquid leakage from syringe plunger 2-Plunger Homing Fault (0) 1-Pump motor lost sync error' 1-Plunger homing error, sometimes solvent delivery error	3	-	1	1	5	3-NTF 1-FA in progress 1-Fail code is not relevant to torpedo. No FA required
	700002597 (Seal Wash Housing)	1-Low H-Class pressure, leak test failed 1-System under pressure, leak of Primary pump.	-	-	2	-	2	2-Seal, O-Ring not returned as a set. No FA required
	WAT270919 (Pump Tray PCBA)	1-Plunger homing error, sometimes solvent delivery error	-	-	-	1	1	1-FA in progress
	700001030 (Pump Tray Assy)	1-failure not specified	-	-	1	-	1	1-Not manufactured by Flex, no FA required
Day 1 (Total 5)	WAT270917 (Fluidics PCBA)	1-3f miss vial	-	1	-	-	1	1-ICT failed for U8 EOL component, no further evaluation
	700011784 (Seal Pack)	1-leaking liquid from seal pack 1-Low needle wash flow, possibility of defective seal pack and wash pump 1-Needle wash fluid does not flow, possibility of defective seal pack, V4 and needle wash pump	3	-	-	-	3	3-NTF
	WAT270928 (Carrousel Carrier Drive)	1-Carousel Drive Malfunction	1	-	-	-	1	1-NTF
TOTAL			7	1	4	2	14	

- 14 parts received. Detailed FA analysis and evaluation completed.
- 7 NTF, 1 failed, 4 parts no FA is required.
- 2 FA in progress,

GPV 279001810 (Trigger Alert limit)

Problem Statement	Investigation/ Possible Root Cause	Corrective Action/ Improvement															
Part Number : 279001810 (ASSY, GPV, DUAL CHANNEL, QSM) Instrument Part Number: 186015080 Issue: 1. Triggered alert limit in WW03’20 to WW04’20 (total 11u reported failed) 2. Triggered alert limit in WW07’20 (total 3u reported failed) Failure at Kallang: Failed test Input Prime with MeOH Date of Manufactured: Jan and Feb 2020 Reported site: Flex Kallang	Triggered Alert Limit at Production and Status <table><tr><th>WW</th><th>Qty failed</th><th>Parker Findings</th><th>Flex Control Build</th><th>Remarks</th></tr><tr><td>WW03'20</td><td>11u</td><td> 8u-NTF (include 5u tested pass at Milford) 2u-damaged Teflon block. (Parker –Reworked) 1u-Teflon Creep. (Parker – Reworked) </td><td> 10u-Passed 1u-Failed </td><td> 1u failed at Flex control build - RTV is in progress. (Parker is suggesting to Milford to scrap this failed unit at Flex) </td></tr><tr><td>WW07'20</td><td>3u</td><td> 3u – Teflon Creep (Parker to scrap on site) </td><td> - NA </td><td> - Before 3u were RTV, WPPL (Tony, Guan Yee and Joel) joint visual check. Result: Found damaged and burr on the Manifold, as shown below.  </td></tr></table>	WW	Qty failed	Parker Findings	Flex Control Build	Remarks	WW03'20	11u	8u-NTF (include 5u tested pass at Milford) 2u-damaged Teflon block. (Parker –Reworked) 1u-Teflon Creep. (Parker – Reworked)	10u-Passed 1u-Failed	1u failed at Flex control build - RTV is in progress. (Parker is suggesting to Milford to scrap this failed unit at Flex)	WW07'20	3u	3u – Teflon Creep (Parker to scrap on site)	NA	Before 3u were RTV, WPPL (Tony, Guan Yee and Joel) joint visual check. Result: Found damaged and burr on the Manifold, as shown below. 	For the Manifold dented and burr: Flex Action: Flex IQA conducted focus checked on Manifold for 2 new lots received. Qty: 150pcs (SKID# 531251883) 100pcs (SKID# 531252432) Result: no dent / scratches observed. Parker Action: TBA (WPPL and Flex continue to work with Parker on their improvement action)
WW	Qty failed	Parker Findings	Flex Control Build	Remarks													
WW03'20	11u	8u-NTF (include 5u tested pass at Milford) 2u-damaged Teflon block. (Parker –Reworked) 1u-Teflon Creep. (Parker – Reworked)	10u-Passed 1u-Failed	1u failed at Flex control build - RTV is in progress. (Parker is suggesting to Milford to scrap this failed unit at Flex)													
WW07'20	3u	3u – Teflon Creep (Parker to scrap on site)	NA	Before 3u were RTV, WPPL (Tony, Guan Yee and Joel) joint visual check. Result: Found damaged and burr on the Manifold, as shown below. 													

Alliance Syringe Drive Movement Error upon Startup

Problem Statement	Investigation/ Possible Root Cause	Corrective Action/ Improvement Action																																				
<u>Instrument</u> : 186269505 and 186269506 <u>Instrument Serial numbers</u> : M19SM7115A M19SM7135A M19SM7136A A20SM4242A A20SM4357A M19SM7144A M19SM7117A A20SM4200A <u>Problem statement:</u> There are reports of 4x 186269505, all made in Dec 2019 (M19) and another 2x 186269506, both made in January 2020 (A20), that had SU failures, all seemingly related to the syringe drive cable not being inserted enough and/or needing to reseat the cable to rid of the “syringe drive movement” error. On 14 May 2020, 2 more cases of startup failure “Syringe Movement Malfunction” were reported: - M19SM7117A – reseated J9 of fluidics driver PCB which resolved the error. - A20SM4200A – reseated the J9 of fluidic driver PCB several times but did not resolve the problem but resolved after reseating J25 cable on the CPU PCB.	<u>Containment Actions (for reseat J9 of the Fluidics Drive PCB) :</u> 1. Screening of WIP instrument level - Syringe assy cable is fully inserted to PCBA 210000416, J9 location. Result: all 11u passed. (Completed on 05 May 2020) 2. Briefing conducted to Alliance Main line assy operators on points to take note when assemble Syringe cable to PCBA connector J9. (Completed on 05 May 2020) <u>Containment Actions (for reseat J25 of the CPU PCB) :</u> 3. Screening of WIP instrument level – CPU Interface Cable is fully inserted, and connector left and right sides latches fully engaged of the PCBA 210000411, J25 location. Result: all 09u passed. (Completed on 15 May 2020) 4. Briefing conducted to Alliance Main line assy operators on points to take note when assemble CPU Interface Cable to CPU PCBA connector J25. (Completed on 15 May 2020) <u>Investigation:</u> 1. DHR reviewed. Result: all 8u passed Rear Panel and Final Test. (Completed on 15 May 2020). 2. FF assembly data – the Syringe Cable assembled to PCBA Connector J9, not assembled by same operator. <table><tr><th>No</th><th>Instrument SN</th><th>Operator who assemble Syringe Cable to PCBA Connector J9</th><th>Date</th></tr><tr><td>1</td><td>M19SM7115A</td><td>836410[Jernail Singh Chahal]</td><td>05-Dec-19</td></tr><tr><td>2</td><td>M19SM7135A</td><td>1074378[Abdul Talib Bin Yusof]</td><td>13-Dec-19</td></tr><tr><td>3</td><td>M19SM7136A</td><td>1074378[Abdul Talib Bin Yusof]</td><td>16-Dec-19</td></tr><tr><td>4</td><td>A20SM4242A</td><td>1070527[Zaidi Bin Jaman]</td><td>10-Jan-20</td></tr><tr><td>5</td><td>A20SM4357A</td><td>1070527[Zaidi Bin Jaman]</td><td>18-Jan-20</td></tr><tr><td>6</td><td>M19SM7144A</td><td>1074378[Abdul Talib Bin Yusof]</td><td>17-Dec-19</td></tr><tr><td>7</td><td>M19SM7117A</td><td>836410[Jernail Singh Chahal]</td><td>05-Dec-19</td></tr><tr><td>8</td><td>A20SM4200A</td><td>1070527[Zaidi Bin Jaman]</td><td>08-Jan-20</td></tr></table> Root Cause: Investigation in progress. Some Improvement Actions are identified.	No	Instrument SN	Operator who assemble Syringe Cable to PCBA Connector J9	Date	1	M19SM7115A	836410[Jernail Singh Chahal]	05-Dec-19	2	M19SM7135A	1074378[Abdul Talib Bin Yusof]	13-Dec-19	3	M19SM7136A	1074378[Abdul Talib Bin Yusof]	16-Dec-19	4	A20SM4242A	1070527[Zaidi Bin Jaman]	10-Jan-20	5	A20SM4357A	1070527[Zaidi Bin Jaman]	18-Jan-20	6	M19SM7144A	1074378[Abdul Talib Bin Yusof]	17-Dec-19	7	M19SM7117A	836410[Jernail Singh Chahal]	05-Dec-19	8	A20SM4200A	1070527[Zaidi Bin Jaman]	08-Jan-20	<u>Improvement Action (for reseat J9 of the Fluidics Drive PCB)</u> 1) To define sufficient Cable sagging and to Lock the purse strings (Cable Tie) from right to left. 2) To add visual check the Syringe Drive Cable connector is latched / locked onto J9 PCB connector after Lock the purse strings (Cable Tie) 3) To add a new checkpoint for the Syringe Drive Cable connection to the Fluidic PCBA J9 at the FVMI station To be completed by Aldwin on 22 May 2020. <u>Improvement Action (for reseat J25 of the FCPU Drive PCB)</u> 1) To add visual check the CPU interface cable connector is latched / locked onto J25 location. To be completed by Aldwin on 22 May 2020.
No	Instrument SN	Operator who assemble Syringe Cable to PCBA Connector J9	Date																																			
1	M19SM7115A	836410[Jernail Singh Chahal]	05-Dec-19																																			
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Alliance Syringe Drive Movement Error upon Startup

Testing Process

Testing:



Rear Panel Test

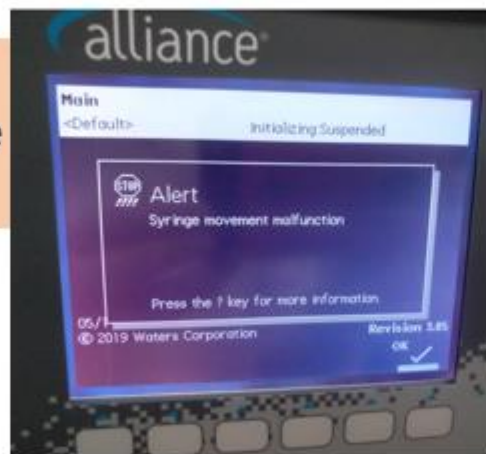


Final Test



Power Up Test

Simulation:
Loose connect Syringe Cable
to PCBA J9 connector



Result : Syringe
Movement Malfunction



Result : Syringe
Movement Malfunction



Result : Syringe
Movement Malfunction

- Simulation done with loose connect syringe cable.
- Able to detect in house of loose connection of Syringe cable to PCBA.
- 4M analysis done with investigation in

4M - Alliance Syringe Drive Movement Error upon Startup

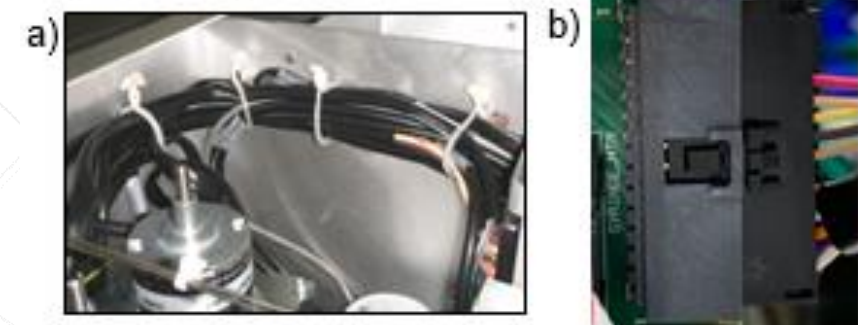
Category	Possible Causes	Verification	Possible Cause (Y/ N)	Improvement Action
Man	1) Untrained/ Uncertified operator	Verified trained/ certified operators performing the task of ASP 279002695 and TSP WAT271129	N	NA
	2) Operators not following the ASP defined steps.	Verified operators perform the task as per procedure ASP 279002695. No abnormality found.	N	NA
	3) Operators not following the TSP defined steps.	Verified operators perform the task as per procedure TSP WAT271129. No abnormality found.	N	NA
Method	1) Cable routing is tight no extra wire allowance for stress relief.	Verified that technician following steps sequence as per procedure ASP 279002695. No abnormality found.	N	To define cable routing and tying of cables to chassis from right to left per OPER 31.0 of 279002695 ASP "Connect all cables to proper connectors from the carousel drive to the fluidics PCB and run the cables through the purse strings." To Add step and illustration. "Lock the purse strings from right to left"
		Simulated loose connection, able to detect failure at Rear Panel Test, Final Test and Power Up test.	N	
	2) Connection of Syringe Drive Cable connector to PCB.	Verified technician following steps sequence as per procedure ASP 279002695. No abnormality found.	N	Visual check the Syringe Drive Cable connector is latched / locked onto J9 PCB connector after connection. Add Visual check in 279002695 ASP. Add Visual check in FVMI WAT-RW-SEC00007 and WAT-RW-SEH00007.
		Verified an audible "click" sound can be heard when syringe drive connector is engaged / locked onto J9 of PCB	N	
Material	1) Defective Cable connector.	Verification of Cable for Motor Assy (WAT045508) No abnormality found during in coming inspection.	In Progress	
		Verification of Cable for Switch Assy (WAT045319) No abnormality found during in coming inspection.	In Progress	
		Verification of Connector Bracket (WAT045121) No abnormality found during in coming inspection.	In Progress	
	2) Defective J9 PCB connector.	Verification of PCBA (210000416) No abnormality found during in coming inspection.	In Process	
Machine	1) Defective tool.	Using hand to snap the Syringe Drive Cable connector to PCB connector and to ensure connector is engaged / locked	N	

- Illustration from Flex ASP



- Illustration from Flex FVMI Checklist

Top View



- a) Wires routed neatly & cables tie are locked (x4).
- b) Syringe drive cable connector is latched / locked onto J9 PCB connector.

Continuous Improvement Update

Continuous Improvement Journey

Quality

- ✓ Yield improvement workshop.
- ✓ Joint Yield review.
- ✓ Supplier process audit .
- ✓ Supplier process capability (Cpk).
- ✓ PCBA non clean to clean.

4M

- ✓ ASP/TSP Verification.
- ✓ Training competency & Recertification.
- ✓ Defect recognition library.
- ✓ Engg, Quality & SC engagement reviews.
- ✓ Tool drawing Verification.
- ✓ Supplier tooling health check

Enhancement

- ✓ e Training records.
- ✓ e Work Instruction.
- ✓ Training Poke Yoke.

2017

Quality

- ✓ Yield improvement workshop.
- ✓ Quality review and alert level process.
- ✓ Supplier process audit & capability (Cpk).
- ✓ Process quality -> Product quality.
- ✓ Debug cookbook.

4M

- ✓ ASP/TSP implementation.
- ✓ Recertification process.
- ✓ Training Poke Yoke penetration%.
- ✓ Consigned equipment health review.
- ✓ Capacity ramp Wellness project.

Enhancement

- ✓ Clean room process, flow improvement.
- ✓ Spares process enhancement.
- ✓ SPC implementation.

2018

Quality

- ✓ Yield improvement workshop.
- ✓ Yield review mechanism enhancement
- ✓ PCBA FA capability at Flex Senai.

4M

- ✓ Consigned test equipment repair/ upgrade
- ✓ Consigned tooling health assessment
- ✓ Recertification and competency check.
- ✓ Space creation for new business.

Enhancement

- ✓ Joint lean workshop Box optimization.
- ❑ e DHR.
- ❑ Pick to scan

2019

Quality

- ❑ Yield improvement workshop - Hard failure
- ❑ Yield improvement workshop - Soft failure
- ❑ Field data -> Factory quality improvement.

4M

- ✓ Capacity review & enhancement.
- ❑ Job breakdown sheet for critical process.
- ❑ Q Alert and TMD linkage in eDHR.

Enhancement

- ❑ CR - Sheet metal Value Engineering.
- ❑ CR - PCBA Value Engineering.
- ❑ Automation serial number traceability to PO.

2020

2020 Overall CI Update

 Closed

 In Progress

Continuous Improvement Plan – Focus Areas		Objective/Goal	Responsible	Jan-Mar	Apr-Jun	Jul- Sep	Oct - Dec
Quality	1. Yield Improvement – Soft failures	Focus top 2 failures (Soft failures)	Joel / Hua Zhen	Comm Failure 4M actions PDA Dual Noise 4M action TUV	- Comm Failure Data collection - Dual Noise Monitoring - Interface tubing BSM/QSMP - 210000520 Monitoring - GPV Hot Part 14/14	Comm Failure	Leak Detection Failure
	2. Yield Improvement – Hard failures	Focus on top 2 failures (Hard failures)	KS Chua	210000520 Ping test for U11 GPV		-	-
	3. Field data -> Factory quality improvement	Focus on Hot Part / Start up failures	KS Chua	Hot Part 12/14			
Enhancement	1. eDHR	Increased process robustness	Aldwin	BSM/QSM Plus	BSM/QSM Plus	Alliance	Alliance
	2. Pick to Scan (Supermart)	Enables picking using barcode.	Anil	Hardware Trial	Go Live KTS	Go Live KTE	Go Live KTE
	3. CR - Sheet metal Value Engineering.	Sheet metal CR	Amy	PEM	PEM-Drop test	-	-
	4. CR - PCBA Value Engineering.	PCBA CR	Amy	Hard tools	Hard tools	-	-
	5. Shipping box optimization(Joint lean workshop)	Alliance/Detectors box optimization	Gary / Niu Niu	KIV	KIV	-	-
	6. Automation serial number traceability to PO.	Enhanced Baan - for SN scanning during shipment	Niu Niu	ECO 9234407 Plan	Spares Go Live	Spares -	- -
4M	1. Recertification and Competency Check	Operator compliance to ASP/TSP	Aldwin / Gary	Pumps	Alliance	BSM/QSM	Detectors
	2. Capacity review & enhancement.	Capacity	Amy / Aldwin		-	-	-
	3. Q Alert linkage to eDHR.	Increased process robustness	Aldwin	-	-	BSM/QSM	-
	4. TMD linkage to eDHR.	Increased process robustness	Aldwin	-	-	-	BSM/QSM
	5. Testers capacity Review	Ensure enough capacity of Testers	Joel/Hua Zhen	Pump tray tester	-	-	-
	6. Testers upgrade	Refurbishment of test equipment	Joel/Hua Zhen	Pump tray (3x)	-	Alliance FT (x8)	SM FT (x8)

• Communication Failure : All identified 4M Actions completed and collection of data in progress.

• eDHR : Go Live for BSM/ QSMP family.

• Pick to Scan : Hardware trial in progress and target to implementation in Q2'20.

• Serial number traceability to PO : Go Live complete.

23 Sheet metal Value Engineering : 3 parts soft tool changed to Hard tool. PEM Hardware qualification in progress.

Yield Improvement – Communication Failure

Project Title : Yield Improvement Communication Failure

Line / Area : Detectors

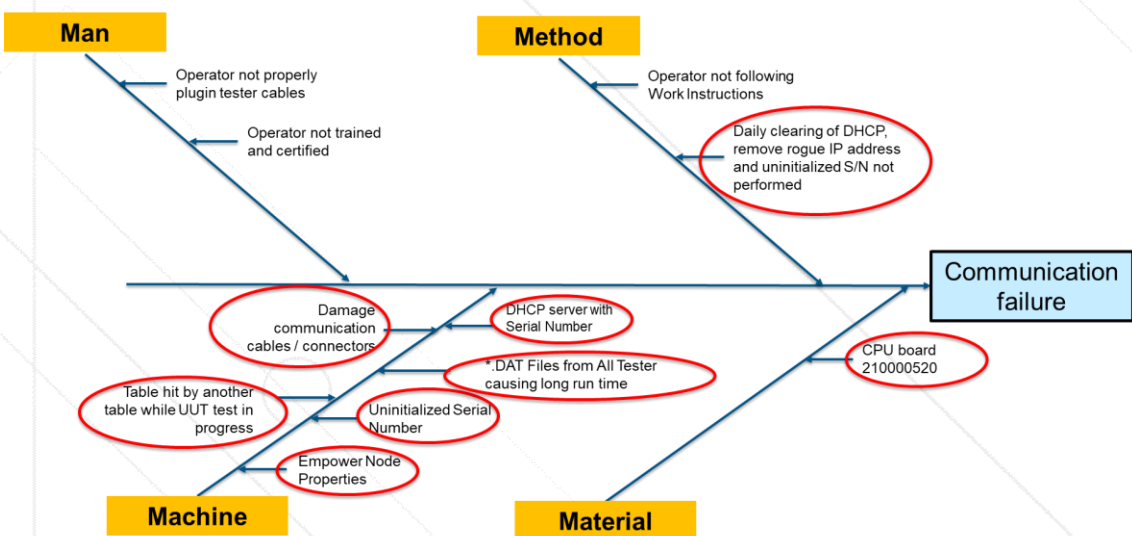
Category : Operation

Type : SGA

Team Lead : Joel

Team Members : Hua Zhen, David, Shamsul, Aldwin

Possible Causes :



Objectives:

➤ To improve communication failure rate by 50%

Goals :

No	CTQ	Before	Target	% Improvement
1	Communication failure rate	9.68%	5 %	51%

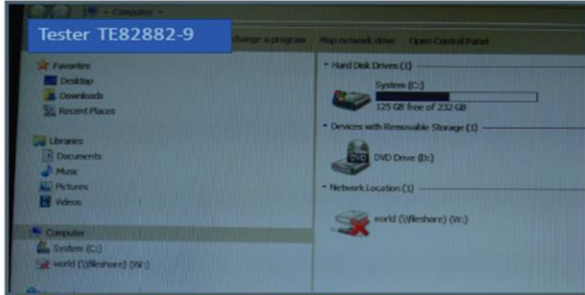
Verification of Possible Causes :

	Possible Causes	Verification	Possible cause (Y/ N)	Proposed Actions
Man	1) Operator not properly plugin tester cables	Verified, trained/ certified Tech/Operators performing Detector Testing as per document provide by WPPPL. No abnormality found.	N	N/A
	2) Operator not trained and certified	Verified that Tech/Operators performing test for detectors as per document 735001616 provided by Waters. No abnormality found	N	N/A
Method	Operator not following Work Instructions	All test procedures as per TSP provide by Waters test PDA Detector Family. Refer to PN table at 735001613 No abnormality found	N	N/A
	Daily clearing of DHCP, remove rogue IP address and uninitialized S/N not performed	Daily clearing of DHCP, remove rogue IP address and uninitialized S/N is clearly mentioned and learned by technician / operator performing the test for PDA Detector Family	N	N/A
Material	CPU board 210000520	Verified NCMR flow and did not see reject related to CPU related to loss com	N	N/A
Machine	Test Station: 1. Old *.DAT file causing long test run time. 2. DHCP server with Serial Number 2.1 IP Address 2.2 Uninitialized Serial Number 3. Empower Node Properties 4. Damage communication cables / connectors 5. Using trolley instead of fixed table	26 Dec – 2019 Completed the removal of old *.DAT to all TE82882 PDA Final Tester. 03 Mar 2020 - UUT is tested as complete assembled unit and failure able to detect to below station. Test stations have yearly PM for CPU as per station required..	Y	To perform daily task by Test EA as below before release tester to production - Restart tester CPU (Workstation computer) - Click Stop Acquity Process - Clear Waters DHCP Server to address item 1, 2, 3, 4 - Ensure the Ethernet cable lock is not broken to address item 5. - Collect 600 units data points to assess tester related failure

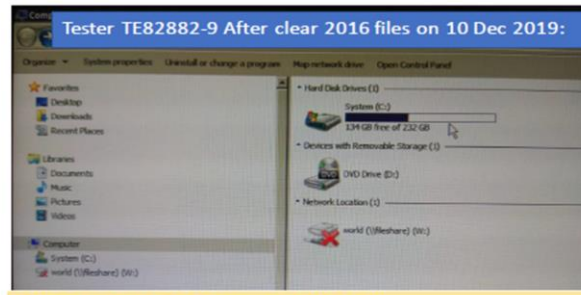
Yield Improvement – Communication Failure

1.

Removed old *.DAT files.



Before : 125 GB free of 232 GB



After : 134 GB free of 232 GB

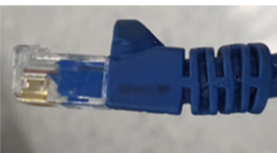
Plan Activity	Tester	Date	Status
Remove old DAT files	8, 13, 14	22 Nov 2019	Completed
Remove old DAT files (2016)	9	10-Dec-19	Completed
Remove old DAT files (2017-2018)	9	13-Dec-19	Completed
Remove old DAT files	10, 11	26-Dec-19	Completed

2.

Damage communication cables / connectors



Ethernet Connector Lock
– Good Condition

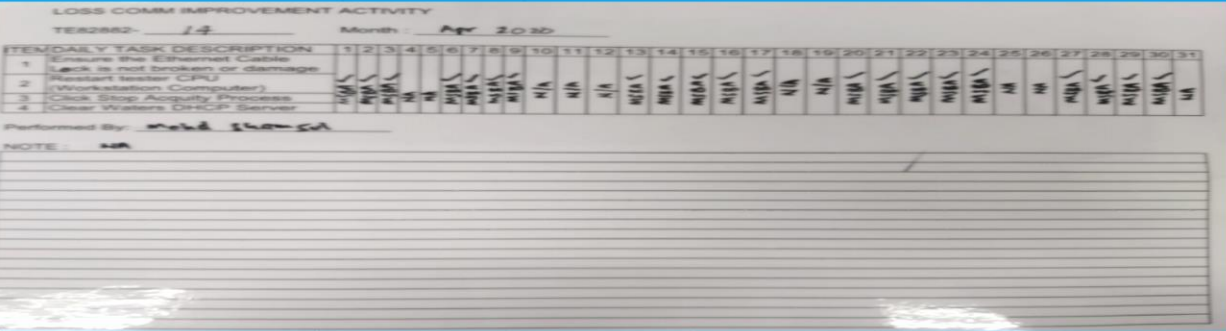


Ethernet Connector Lock
– Not good Condition

- All ethernet ports has been verified in good condition - Monitoring in progress

[illegible]

5.



3.

Table hit by another table while UUT test in progress

BEFORE :



Tester without spacer in between UUT

Tester with spacer in between UUT accidental bumps on the UUT potentially disturbing communication between UUT and Tester



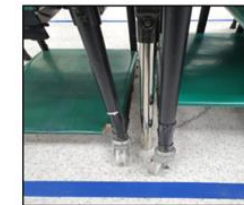
TE82882-13 Introduced a spacer between test position to avoid knocking table

AFTER:



Tester with spacer in between UUT

Tester with spacer in between UUT avoid accidental bumps on the UUT potentially disturbing communication between UUT and Tester



4.

- Updated the Empower Node Properties for Testers TE82882-8, -9, -10, -11, -13, -14 per TSP under section 6.5.1

6.5. To troubleshoot Lost Comm errors:

6.5.1. In the list of instruments, there should only be up to 20 systems (Address ACQ-PDA#1 through #4, and #9 through #12, W2998#5 through #8, A10#13-16, A30#17-20). If there are any other systems listed with typical serial numbers (A09UPD011M) or 'serial number uninitialized', click **remove**.

BEFORE

[illegible]

Uncommon **Red** system

AFTER

Empower Node Properties													
Empower	Node T63282-9 Properties		Node T63282-9 Properties		Node T63282-11 Properties		Node T63282-11 Properties		Node T63282-13 Properties		Node T63282-14 Properties		
	Type	Address	Type	Address	Type	Address	Type	Address	Type	Address	Type	Address	
1	ACQ-PPA	ACQ-PPA#1	ACQ-PPA	ACQ-PPA#1	ACQ-PPA	ACQ-PPA#1	W2599	W2599#1	W2599	W2599#1	A10-PPA	A10-PPA#1	
2	ACQ-PPA	ACQ-PPA#2	ACQ-PPA	ACQ-PPA#2	ACQ-PPA	ACQ-PPA#2	W2599	W2599#2	W2599	W2599#2	A10-PPA	A10-PPA#2	
3	ACQ-PPA	ACQ-PPA#3	ACQ-PPA	ACQ-PPA#3	ACQ-PPA	ACQ-PPA#3	W2599	W2599#3	W2599	W2599#3	A10-PPA	A10-PPA#3	
4	ACQ-PPA	ACQ-PPA#4	ACQ-PPA	ACQ-PPA#4	ACQ-PPA	ACQ-PPA#4	W2599	W2599#4	W2599	W2599#4	A10-PPA	A10-PPA#4	
5	W2599	W2599#5	W2599	W2599#5	W2599	W2599#5	ACQ-PPA	ACQ-PPA#5	A10-PPA	A10-PPA#5	W2599	W2599#5	
6	W2599	W2599#6	W2599	W2599#6	W2599	W2599#6	ACQ-PPA	ACQ-PPA#6	A10-PPA	A10-PPA#6	W2599	W2599#6	
7	W2599	W2599#7	W2599	W2599#7	W2599	W2599#7	ACQ-PPA	ACQ-PPA#7	A10-PPA	A10-PPA#7	W2599	W2599#7	
8	W2599	W2599#8	W2599	W2599#8	W2599	W2599#8	ACQ-PPA	ACQ-PPA#8	A10-PPA	A10-PPA#8	W2599	W2599#8	
9	ACQ-PPA	ACQ-PPA#9	ACQ-PPA	ACQ-PPA#9	ACQ-PPA	ACQ-PPA#9	ACQ-PPA	ACQ-PPA#9	ACQ-PPA	ACQ-PPA#9	ACQ-PPA	ACQ-PPA#9	
10	ACQ-PPA	ACQ-PPA#10	ACQ-PPA	ACQ-PPA#10	ACQ-PPA	ACQ-PPA#10	ACQ-PPA	ACQ-PPA#10	ACQ-PPA	ACQ-PPA#10	ACQ-PPA	ACQ-PPA#10	
11	ACQ-PPA	ACQ-PPA#11	ACQ-PPA	ACQ-PPA#11	ACQ-PPA	ACQ-PPA#11	ACQ-PPA	ACQ-PPA#11	ACQ-PPA	ACQ-PPA#11	ACQ-PPA	ACQ-PPA#11	
12	ACQ-PPA	ACQ-PPA#12	ACQ-PPA	ACQ-PPA#12	ACQ-PPA	ACQ-PPA#12	ACQ-PPA	ACQ-PPA#12	ACQ-PPA	ACQ-PPA#12	ACQ-PPA	ACQ-PPA#12	
13	A30-PPA	A30-PPA#1	A10-PPA	A10-PPA#1	A30-PPA	A30-PPA#1	A10-PPA	A10-PPA#1	ACQ-PPA	ACQ-PPA#1	ACQ-PPA	ACQ-PPA#1	
14	A30-PPA	A30-PPA#2	A10-PPA	A10-PPA#2	A30-PPA	A30-PPA#2	A10-PPA	A10-PPA#2	ACQ-PPA	ACQ-PPA#2	ACQ-PPA	ACQ-PPA#2	
15	A30-PPA	A30-PPA#3	A10-PPA	A10-PPA#3	A30-PPA	A30-PPA#3	A10-PPA	A10-PPA#3	ACQ-PPA	ACQ-PPA#3	ACQ-PPA	ACQ-PPA#3	
16	A30-PPA	A30-PPA#4	A10-PPA	A10-PPA#4	A30-PPA	A30-PPA#4	A10-PPA	A10-PPA#4	ACQ-PPA	ACQ-PPA#4	ACQ-PPA	ACQ-PPA#4	
17	A30-PPA	A30-PPA#5	A10-PPA	A10-PPA#5	A30-PPA	A30-PPA#5	A10-PPA	A10-PPA#5	ACQ-PPA	ACQ-PPA#5	ACQ-PPA	ACQ-PPA#5	
18	A10-PPA	A10-PPA#13			A10-PPA	A10-PPA#13							
19	A10-PPA	A10-PPA#14			A10-PPA	A10-PPA#14							
20	A10-PPA	A10-PPA#15			A10-PPA	A10-PPA#15							
21	A10-PPA	A10-PPA#16			A10-PPA	A10-PPA#16							

- After the Empower Node Properties update:
 - Tester TE82882-8, -10 having 20 system address.
 - Tester TE82882-11, -13, -14 having 16 system address.
 - A10-PDA and A30-PDA are not currently running at Flex

1. Removed old *.DAT Files
from 2016 to 2019

2. Review Ethernet\RS232 interface headers.

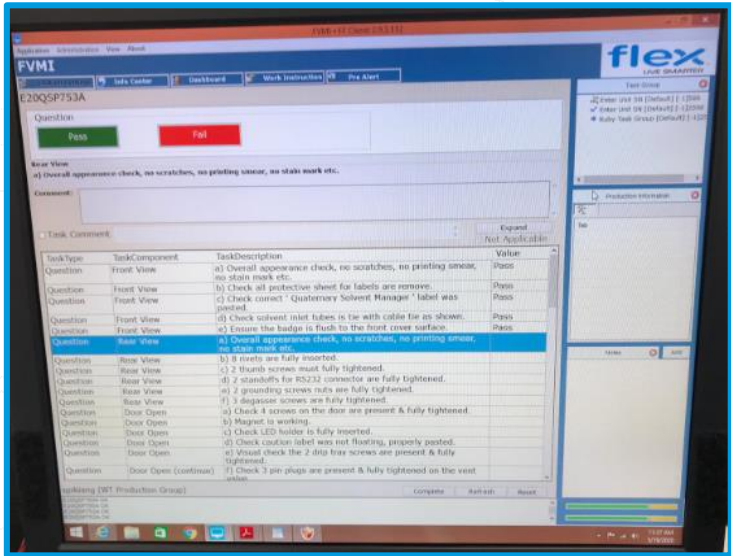
3. Mount separating fence per UUT to avoid disturbance during test in-progress

4. Removed Empower Node with conflict

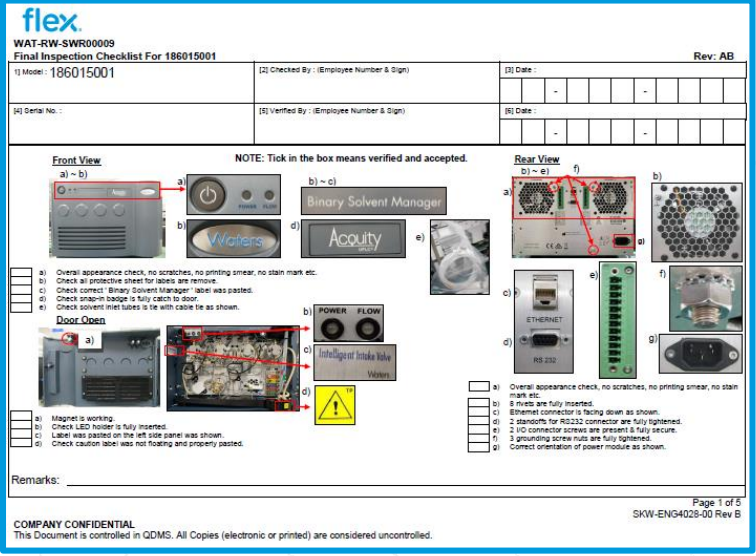
5. Test Operator daily clearing of DHCP, remove rogue IP address and initialize the SN.

- All identified 4M Actions completed and collection of data for 600 data point in progress.

Continuous Improvement – eDHR



✓ Production and QA performing eDHR at designated station PC.



✓ Production and QA browsing respective FVMI and FQA Inspection Checklist at designated station PC.



- eDHR Go Live on BSM & QSM Family
- Total 146 units of BSM & QMS Plus now in eDHR.

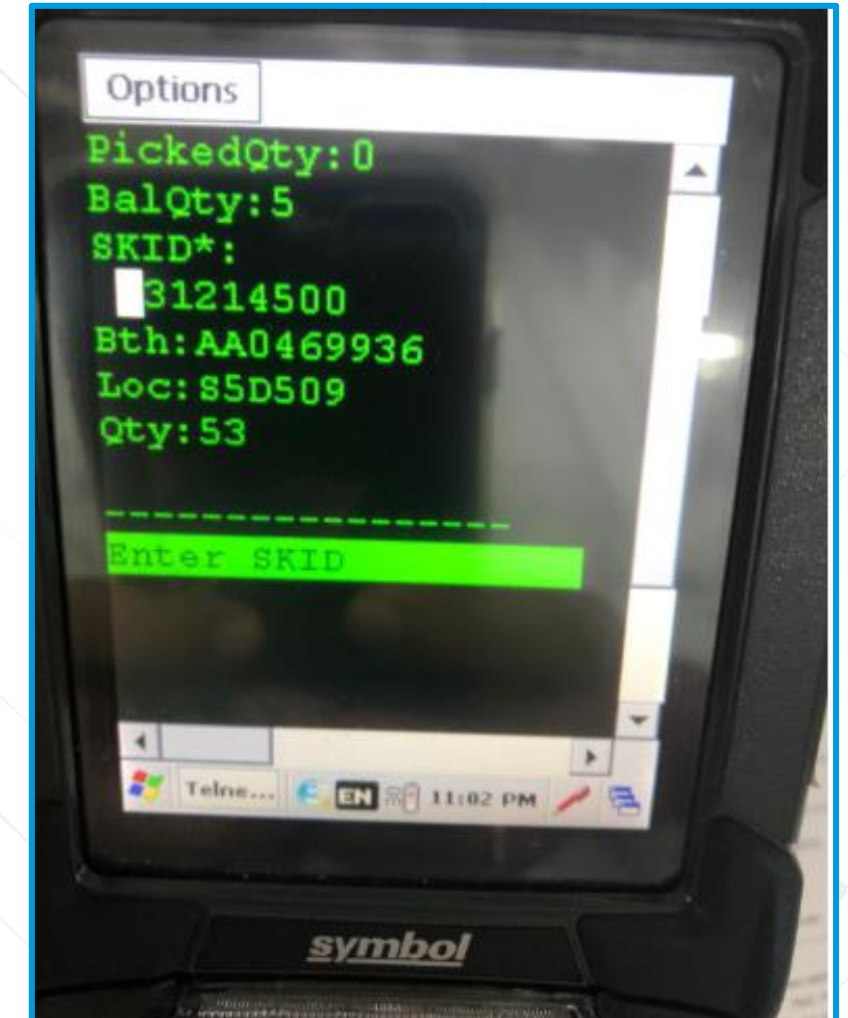
Continuous Improvement –Pick to Scan



- ✓ Scanner set-up and ready for use.



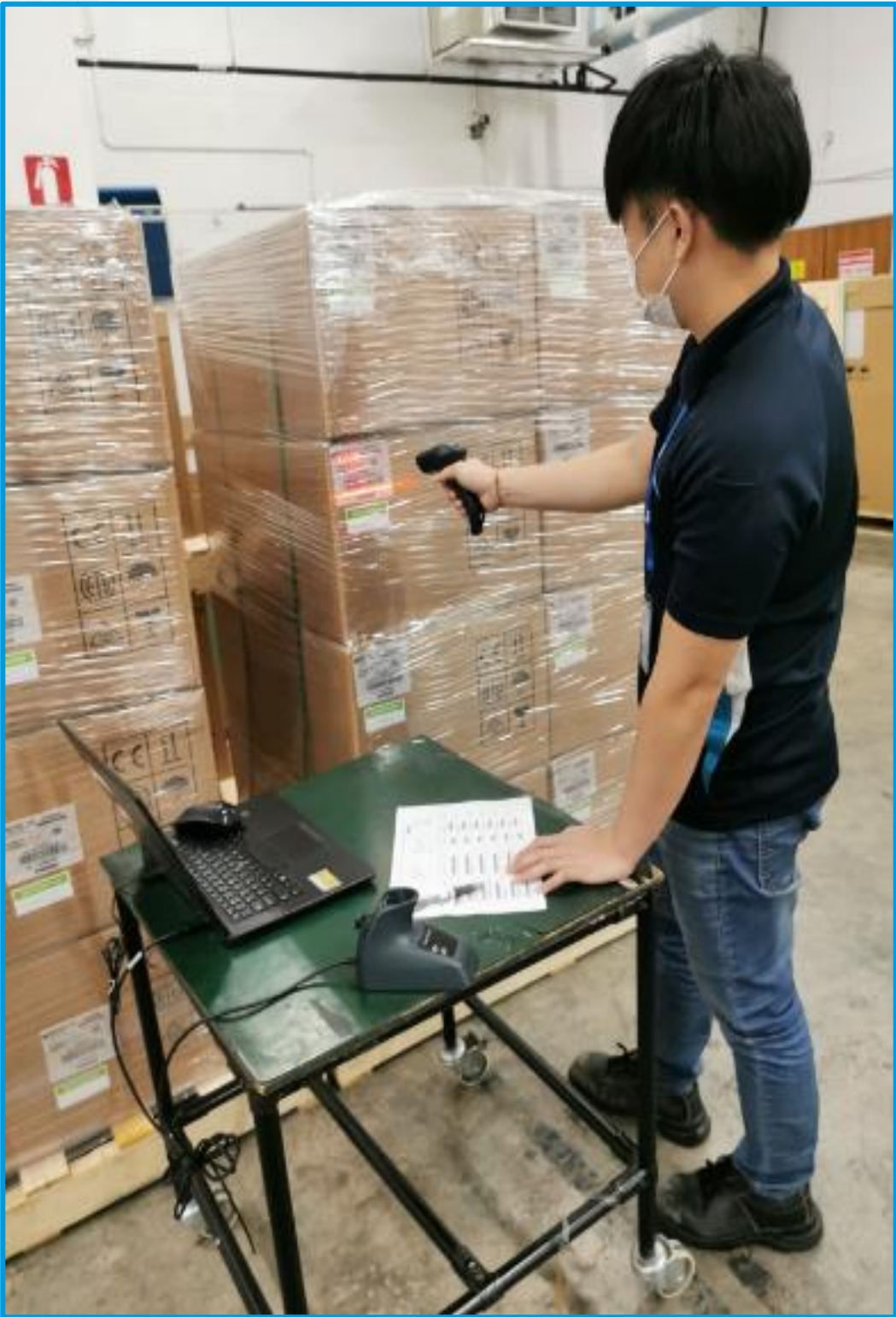
- ✓ Materials personnel doing trial Pick to Scan inside the Supermarket.



- ✓ Part to be picked is shown in the scanner screen after every time scanning of part SKID barcode.

- Pick to Scan hardware received, testing in progress and implementation planned in Q2'20.

Continuous Improvement- Automation SN traceability

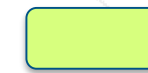


flex SHIP TO: Waters Pacific Pte. Ltd. Schenker Singapore (Pte) Ltd, 51 ALPS Avenue #07-04 Singapore, 496783 SINGAPORE										PACKING LIST		Flextronics Manufacturing (Singapore) Pte Ltd 1 Kallang Place, Singapore 339211 Tel: 6507 6507 Fax: 6844 2251 CO.REG.NO.:198101202H GST REG.NO.: M90366623R			
												LOAD No : LOD030387 Customer No : CU12WT03D Page : 4 Date : 15-May-2020			
Pal-let Qty.	Pallet Gross Wt (Kg)	Pallet Dimension (cm)	Pck/Box Grp	Box Qty.	Box Weight (Kg)	Box Dimension (cm)	Pck/Package ID	Part Number	Description	Qty	UOM	Serial No/ Lot/Box ID	COO	Customer PO/ Release	Commercial Invoice
1	62.00	78X60X94	PLT	1			WT-032581	186269506 Revision No:M	e2695 Separations Module w/SHC		lea	E20SM4162A	SG	4502491592	S30853948
1	62.00	78X60X94	PLT	1			WT-032582	186269506 Revision No:M	e2695 Separations M						
1	62.00	78X60X94	PLT	1			WT-032583	186269506 Revision No:M	e2695 Separations M						
1	166.50	120X100X144	PAL	1	0.00	0X0X0	BOX WT-032584	186002998 Revision No:F-2	2998 PHOTODIODE APP			E20SM4162A	SG	4502491592	S30853948
				1	0.00	0X0X0	BOX WT-032585	186002998 Revision No:F-2	2998 PHOTODIODE APP						
				1	0.00	0X0X0	BOX WT-032586	186002998 Revision No:F-2	2998 PHOTODIODE APP			E20SM4156A	SG	4502491592	S30853948
				1	0.00	0X0X0	BOX WT-032587	186002998 Revision No:F-2	2998 PHOTODIODE APP						
				1	0.00	0X0X0	BOX WT-032588	186002998	2998 PHOTODIODE APP			E20SM4165A	SG	4502491592	S30853948

- System Go live!. Can expedite SN traceability by PO.
- Flex shipping scan instrument SN base on shipping request.
- Both instrument SN and PO will show on the packing list.

Continuous Improvement –Sheet Metal VAVE

Sheetmetal Value Engineering Update



Closed



In Progress

PN	Current cost	New cost	EAU	Process change to hard tool	Purchase Part change (Hardware)	Remove Hairline	Powder coat Change	Passivation	Annual savings
WAT-205001016	273.2	232.4	3728	8.84	17.07	-	14.94	-	152,288.80
WAT-400007148-G	59.65	49.41	4536	3.16	4.42	2.66	-	-	46,448.64
WATH-289005258-G	290.2	217.2	1553	12.41	28.74	-	30.85	0.96	113,306.88
WATH-400007377-B	48.4	35.43	4536	1.48	0.21	-	11.28	-	58,831.92
WATH-WAT270464-03	47.2	40.21	3749	4.74	2.25	-	-	-	26,205.51
WAT-400003642-E	127.4	107.1	1324	7.11	2.89	-	10.29	-	26,863.96
WATH-289005822-A	17.6	13.86	4289	1.07	1.96	-	0.71	-	16,040.86
WATH-289002572-A	13.93	11.45	4473	1.14	1.34	-	-	-	11,093.04
WAT-400005663	8.51	6.87	4536	0.49	0.88	0.27	-	-	7,439.04
Cost Reduction (US\$)				112,370.28	159,925.41	13,290.48	171,441.60	1,490.88	458,518.65

**Annual
CR
US\$187k**

- 3 parts soft tool changed to hard tool, new price phase in Q2'20, CR for 2020 US\$13.4k
- PEM hardware change qualification in last phase-drop test, target to complete in Q2'20.
- Due to demand drop, we only can phase in the new price early 2021

Supply Chain Update

Q2'2020 Materials CTB Outlook

Update as on 22-Apr-20 forecast

Model	186269505	186269506	186015001	186015018	186015080	186001515	186001525	WAT207000	186001825					Potential Risk :-
Ttl Demand	921	2,808	211	0	1,423	53	101	184	0					
	1,257	3,732	241	0	2,005	135	146	256	0					
Changes Qty	(336)	(924)	(30)	0	(582)	(82)	(45)	(72)	0					
Changes %	-27%	-25%	-12%	0%	-29%	-61%	-31%	-28%	#DIV/0!					
Can Do	100%	100%	100%	100%	100%	100%	100%	100%	100%					
	AllianceX Can Do : 100%		BSM/QSM Can Do : 100%			Pump Can Do 100%								

Model	186002487	186002998	186015031	186015032	186015033	186248900	186299800	186015034	186015053	186017002	186017003	186017012	186017013	Potential Risk :-
Ttl Demand	317	179	661	746	594	2,326	1,651	38	17	333	345	0	0	
	468	252	905	1,015	787	3,059	1,941	62	41	545	545	5	2	
Changes Qty	(151)	(73)	(244)	(269)	(193)	(733)	(290)	(24)	(24)	(212)	(200)	(5)	(2)	
Changes %	-32%	-29%	-27%	-27%	-25%	-24%	-15%	-39%	0%	-39%	-37%	-100%	-100%	
Can Do	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	0%	
	All Detectors Can Do : 100%													

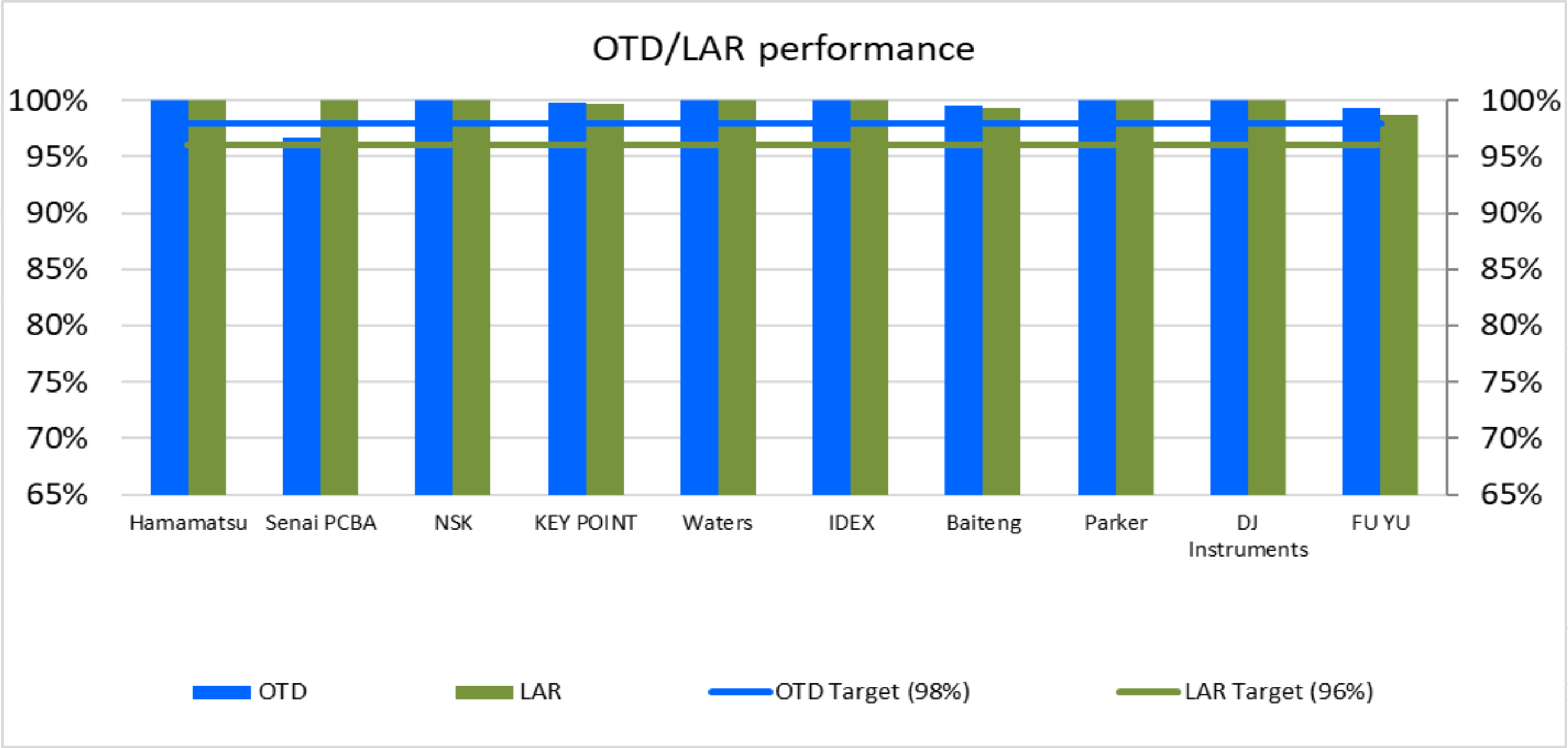
- Close monitoring of suppliers to mitigate impact caused from materials to manpower due to Covid-19 situation.
- Work closely with Waters on the priority list and match with Flex Senai Capacity to ensure the urgent orders are fulfilled.
- Waters help Flex to shift Milford SP power order to Flex to cover Apr and May demand.
- Follow up and work closely on Tyco and Haydon Kerk parts due to the capacity and raw material issue.
- US\$7.79M order push out required due to demand drop. 49% successfully pushed out with the joint effort from Waters material team.

Supply Chain Challenge-Q1'20

Affected Suppliers	Supply Chain Challenges	Mitigation Actions
SHENZHEN Baiteng B AND E	China supplier manpower issue due to China lockdown from end of Jan due to COVID-19. 14days quarantine and capacity control.	Daily call monitor supplier's output after re-open the factory Arrangement the quickturn passivation with their supplier. Convert the ocean shipment to air shipment
FAIR-RITE TOTAL TRONIC System	China supplier and government only allow them to re-open in Mar due to COVID-19	Purchase from Distry with Waters approval
DJ Instrument	US supplier but Child part from supplier. Affected by China lockdown	Milford allocated 100pcs stock to support Kallang
Flex Senai	Malaysia supplier capacity issue due to Malaysia lockdown from mid of Mar due to COVID-19.	WPPL allocation 15pcs from other CMs to close the quarter demand.

- Met numbers for Q1'20.
- Total 21 suppliers with 255 affected parts mitigated with joint efforts from Waters Singapore.

Top 10 supplier *(based on annual spend)* performance – Q1'20



Next Steps

- ❑ Execution of Arc FTN transfer as per plan. Focused engagement to drive 3P (production preparation process) readiness to deliver FTN units from Flex Kallang.
- ❑ Continue to mitigate supply chain and operational challenges due to COVID-19.
- ❑ Close collaboration with Waters to review demand and close any ramp up/down challenges.
- ❑ Continued engagement on the yield improvement projects with focus on soft failures.

Thank You