Optimization of Coverall Inventory Management in the Gowning Areas

Johnson and Johnson Innovative Medicine

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Introduction: The Johnson & Johnson Innovative Medicine facility in Gurabo, Puerto Rico, is a vital hub for the development and production of treatments for diseases like cancer, Alzheimer's, HIV, and cardiovascular conditions. With over 1,200 employees, it produces critical biologics and injectable therapies that are distributed globally. Part of a global network with over 30,000 employees in more than 150 countries, Janssen focuses on healthcare innovation and collaboration. The Gurabo facility plays a key role in ensuring the availability of life-saving treatments and supports the company's mission to provide accessible, effective healthcare solutions worldwide.

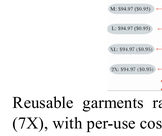
"Learning is a journey, not a destination; each step builds the path to growth and discovery." - Arthur Ashe

D DEFINE

PROBLEM STATEMENT

The gowning areas at Johnson & Johnson Innovative Medicine in Gurabo has trouble keeping enough coveralls in the right sizes. Only 37.5% of workers find their correct size, while 87.5% wear gear that doesn't fit well. This slows down shift changes and production, making it harder to meet daily targets and increasing costs.

VOICE OF THE EMPLOYEE



A voice of the employee revealed frequent unavailability of specific sizes (**87.5%**), all contributing to delayed shift changes, production slowdowns, and reduced overall productivity.

FLOWCHART

WASTES:	Transportation	Waiting	Motion	Skills	Defects
	There are over **250m** in distance between the gowning rooms Delay time of **+ 30 mins**	Used coveralls ready for cleaning or delivery by Cadillac, wait time **> 2days**	Gowning area replenishment times. **> 6 per day**	Associate's culture regarding gowning usage. **85% uses 2+ per day.**	Quarterly waste of **749** coveralls (stains, damage, end of useful life)

CRITICAL TO QUALITY

SIPOC

PRICING & DEPRECIATION PER UNIT

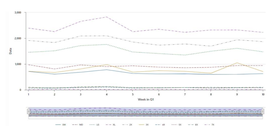
Reusable garments range from $94.97 (SM–2X) to $152.14 (7X), with per-use costs from $0.95 to $1.52 based on a 100-use lifespan. While designed for 100 uses, early decommissioning due to failed inspections increases the actual cost per use.

M MEASURE

ACTUAL INVENTORY FOR Q1 2024

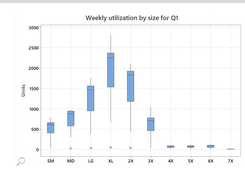
Gowning size's L, XL and 2XL had the 68% of total inventory quantity for Q1 of 2024 with 11,732 units out of 17,203 total units.

TIME SERIES DISTRIBUTION OF GOWNING UTILIZATION FOR Q1 OF 2024



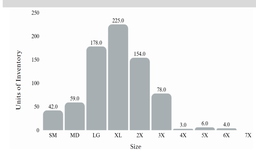
The Size XL had the highest and most stable utilization, peaking near 3,000 units. LG and 2X followed with 1,500–2,200 units, while other sizes saw lower and less consistent demand.

BOX PLOT

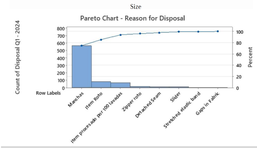


In terms of median weekly utilization, XL had the highest demand (~2,200 units), followed by 2X (~1,800) and LG (~1,500). Smaller sizes (SM–MD) and larger sizes (3X–7X) had significantly lower usage, with the largest sizes remaining below 100 units.

DECOMMISSIONING HISTORY

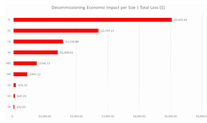


In Q1 2024, mid-range gown sizes had the highest decommission rates, led by XL (225 units), followed by LG (178) and 2X (154). In contrast, smaller and larger sizes (4X, 5X, 6X) showed lower turnover.

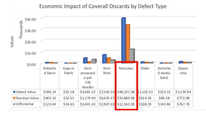


Data analysis revealed that stains accounted for 80% of all decommissioning.

DECOMMISSIONING ECONOMIC IMPACT



The sizes with the most utilization and decommissioning (L, XL, 2XL) resulted in the greatest economic loss for the company with a total of $9,316.71 for Q1 of 2024.



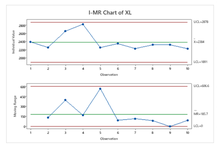
Stains represent the highest economic impact among coverall discards, with a differential cost of $12,342.00 for Q1 of 2024 due to the large gap between stated and residual values.

ECONOMIC IMPACT OF DOWNTIME

In 2024, downtime incidents led to $1.89 million in losses, 82% from manufacturing and 18% from packaging, highlighting a critical need to address inefficiencies in key production areas.

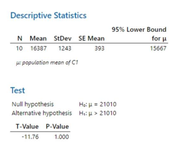
A ANALYZE

I-MR FOR X-LARGE COVERALLS



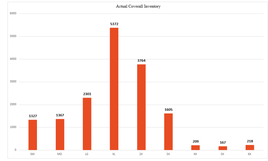
The I-MR analysis for X-Large Coveralls shows a stable process, with values consistently within control limits (UCL = 2878, LCL = 1891) and no significant outliers. The moving range chart confirms controlled variation, supporting consistent inventory performance and the importance of ongoing monitoring.

INDIVIDUAL VALUE PLOT



The Individual Value Plot shows that the current inventory level is significantly below the ideal inventory target of 21,010 units. This suggests a potential risk of inventory shortages, which may impact operations.

SIZE DISTRIBUTION FOR ACTUAL INVENTORY (1.95 WEEKS)



A total of 16,804 coveralls are required, representing 1.95 weeks of inventory. Currently, there is no safety stock in place, increasing the risk of supply disruptions. As a result, the limited inventory levels contributed to 12 stockout events over the past year.

SAFETY STOCK & REORDER POINT FOR ACTUAL INVENTORY (1.95 WEEKS)

Size	Average Weekly Consumption	Total Inventory	Standard Deviation	Safety Stock
SM	649	1327	59	392
MD	908	1367	53	346
LG	1525	2391	132	867
XL	2384	5372	199	1313
1X	1881	3764	135	889
2X	773	1605	135	890
3X	81	209	13	85
4X	89	167	14	92
5X	98	218	17	111
6X	15	76	5	30

Safety Stock Formula
Z(99%) = 2.33
Lead time = 8 weeks
SS (x) = Z * SD * (Lead Time) ^ 0.5

Safety Stock for XL
SS (XL) = 2.33 * 199 * (8)^0.5
= 2.33 * 199 * 2.83
=1313

Safety stock, based on demand variability and an 8-week lead time, helps prevent stockouts. XL needs the most (1,313 units) due to its high and variable demand.

Size	Replacement Rate (Decomission)	Safety Stock	Reorder Point
SM	4	392	425
MD	6	346	393
LG	18	867	1009
XL	23	1313	1493
2X	17	889	1025
3X	8	890	953
4X	0	85	86
5X	1	92	97
6X	9	111	114

Reorder Point Formula
Lead time = 8 Weeks
ROP (x) = (Replacement Rate x Lead time) + Safety Stock

Reorder point for XL
ROP (XL) = (23 x 8) + 1313
= 1493

High reorder points for XL, LG, and 2X reflect strong demand, while low points for 4X and 6X indicate minimal use. Aligning reorder points with lead times ensures efficient inventory management.

FISHBONE & 5 WHY

I IMPROVE

SAFETY STOCK & RE ORDER POINT FOR 2.3 WEEKS PROPOSAL

Size	Total Inventory Allocation	Average Weekly Consumption	Standard Deviation	Safety Stock Units	Total Units
SM	8%	1493	247	132	1,627
MD	11%	2089	345	185	2277
LG	18%	3508	579	310	3823
XL	28%	5484	906	485	5977
2X	22%	4325	714	382	4714
3X	9%	1779	294	157	1939
4X	1%	185	31	16	201
5X	1%	206	34	18	224
6X	1%	226	37	20	246

Safety Stock Formula
Z(99%) = 2.33
Lead time (LT) = 8 weeks
CV = 0.165159
SS (x) = Z * TIA* CV * (LT)^ 0.5

Safety Stock for Small
SS (XL) = 2.33 * 1493* .165159 *(8)^0.5
= 2.33 * 1493* .165159 * 2.83
=1627
=132 safety units

Safety stock levels were adjusted for demand variability; higher for XL (485), 2X (382), and LG (310), and lower for 5X (18) and 6X (20). A 99% service level and 8-week lead time ensured buffer coverage, aligning total inventory with the 21,000-unit target and controlled process variation.

Size	Replacement Rate (Decomission)	Safety Stock	Reorder Point
SM	4	1493	1527
MD	6	2089	2136
LG	18	3508	3650
XL	23	5484	5668
2X	17	4325	4461
3X	8	1779	1841
4X	0	185	187
5X	1	206	211
6X	0	226	229

Reorder Point Formula
Lead time = 8 Weeks
ROP (x) = (Replacement Rate x Lead time) + Safety Stock

Reorder point for XL
ROP (XL) = (23 x 8) + 5484
= 5668

* this number was designed to match the 21,000 inventory level desired by the client & to align with the controlled variation of the process

Reorder points were calculated based on an 8-week lead time. Sizes with higher replacement rates, like XL (23), have higher reorder points (ex. 5668), while sizes with zero replacement rates (4X, 5X, 6X) have minimal reorder values.

SIZE DISTRIBUTION FOR 2.3 WEEKS PROPOSAL

A total of 21,000 coveralls are required, consisting of 19,299 for circulating inventory and 1,701 for safety stock. This equates to 7 pickups/deliveries or 2.3 weeks of inventory.

ECONOMIC ANALYSIS FOR 2.3 WEEKS PROPOSAL

Size	Current Inventory	Optimum Inventory	Quantity to Order	Price per unit	Total Price
SM	1,599	1627	27$	$94.97	$23,896.07
MD	1627	2277	650	$94.97	$42,746.50
LG	3,229	3823	594	$94.97	$56,422.18
XL	4942	5977	1035	$94.97	$98,283.95
2X	3561	4714	1153	$94.97	$109,500.41
3X	1643	1939	296	$105.91	$30,757.36
4X	207	201	-6	$114.50	($687.00)
5X	174	224	90	$125.74	$11,316.60
6X	102	246	64	$139.05	$8,899.20
Total	17121	21020	3913		$379,854.27

Procuring optimal coverall inventory at a cost of $379,854.27 only 21% of annual downtime losses could reduce downtime by 50%, saving the facility approximately $900,000 per year.

With a projected ROI of 137%, this investment enhances safety, ensures production continuity, and improves employee readiness across all coverall sizes.

CADILLAC REVISIT OF PROCESS

Cleaning of stained coveralls could reduce unnecessary decommissioning and optimize inventory management levels. A Second QA inspection ensures only coveralls meeting standards are reincorporated into the cycle.

ADQUISITION WASHER AND DRAWER

With a $21,280.71 investment, the number of coveralls decommissioned due to stains (565 units) is expected to decrease, reducing economic losses ($12,342). By enabling internal cleaning at J&J, the process allows for the recovery of rejected coveralls and minimizes unnecessary disposal. *Estimated ROI: 3.5 Quarters*

C CONTROL

INVENTORY MANAGEMENT: VISUAL CUE SYSTEM

Implement a color-coded or visual marker system in the storage area to signal when inventory reaches the reorder point. When stock drops to 5,485 units (Reorder Point), a visual cue prompts the Supervisor to initiate a reorder. This ensures replenishment before reaching the Safety Stock level of 485 units, maintaining availability up to the Maximum Quantity of 5,970 units.

VISUAL AIDS FOR COVERALL REUSE

Clear visual cues support coverall reuse, reducing waste and supporting sustainability goals. They also improve inventory accuracy by encouraging proper storage and help ensure compliance with gowning protocols, reinforcing GMP and operational readiness.

VENDOR PERFORMANCE MONITORING

A vendor performance monitoring process ensures long-term supply stability and consistent coverall availability. Key metrics tracked include lead time under 56 days, order accuracy above 99%, delivery quality over 95%, and issue resolution within 3 days to support proactive inventory control.

CONCLUSION

The project demonstrated that a reactive and unstructured inventory approach led to operational disruptions, excessive costs, and poor user experience. By adopting a proactive, data-driven system with defined safety stocks and reorder points, Johnson & Johnson can ensure consistent coverall availability and reduce quarterly losses. The implementation of internal cleaning processes and enhanced visual management is expected to further stabilize the supply chain, promote sustainability, and support continued operational excellence.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to Arnaldo Hernandez and Janice Colón for their cooperation and invaluable insights throughout this project. Their willingness to provide feedback and share their experiences was instrumental in identifying key areas of improvement. We also wish to acknowledge the support and guidance of our professor Luis Olivares, whose expertise and encouragement were crucial in shaping this project. Additionally, we would like to recognize the dedication and collaborative efforts of the project team, without whom this solution would not have been possible.