Eliminating Shadow Warehouse and Improving Inventory Performance in A Nickel Mine Company

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Abstract

Spare part inventory contributes significantly to the overall inventory cost of the company. Spare part inventory is needed to support the maintenance process in order to maintain the reliability of the production facility. Quite often burden from spare part inventory is getting more severe when users are located in various sites and the users wanted higher service levels. This paper addresses the problem of shadow warehouses created by users in order to obtain a higher service level. The company currently has 44 shadow warehouses. The aim is to reduce those warehouses and then attempt to centralize the control of inventory by using (Min, Max) inventory control model. The stock parameters adjustment as per the result of the Min-Max inventory control model will increase the service level of criticality B up to 91% and criticality C up to 88%. Hence, the cost reduction of inventory value is USD 199,644.02 for fast-moving material and USD 43,210.82 for medium moving material.

Keywords
Min Max Method, Inventory Management, Shadow Warehouse and Service Level.

1. Introduction

Align to fast and high competition in business nowadays, most businesses are required to have continuous improvement and efficiency in all aspects, both technically and commercially. One of the important and critical aspects that contributes to the efficiency of the organization is the inventory. Improper stock control or underestimating the management of the inventory might lead the company sustainability and production to higher risk which possibly interrupts the supply commitment to the customer. Having inventory to fulfill the demand is critical, but too much inventory would jeopardize the company due to its inherent high cost.

Inventory has an important role in the company to ensure the operation continuity, inventory planning and control shall focus on both demand and supply which shall have an objective in fulfilling demand at competitive cost, therefore inventory must be carefully managed and controlled. Purchasing required spare parts and material shall have special attention to acquisition cost which will directly impact to company's finances. There are many papers addressed the Min-Max methodology. Kinanthi & Herlina, & Finda (2016) analyze how to control the inventory of raw material precisely. Moon and Choi (1994) used the Min–Max distribution free approach to develop a continuous-review inventory model with a service level constraint, Gallmann and Valerie (2010) provided how best performing companies strive to improve their service levels, Wang consider an inventory control system with constraint on the service level. The use of service level constraint is mainly motivated by the difficulty of estimating shortage cost. For which the service level concept is viewed as an appealing practical alternative. Alessandri Angelo (2011) concern the combination of Min-Max optimization and MPC to solve strategic and tactical inventory control problems for the management, meanwhile analysis to anticipate shadow warehouse by using Min-Max method was not found. Analysis in this thesis focus on determining optimum inventory parameters by using the Min-Max method, and impact analysis of Min-Max method implementation to cost and service level achievement.

A warehouse is the storage facility for goods or material required by users to sustain the operation and business of the company for creating values and profit. The physical activities inside the warehouse are including receiving, binning, picking, and deliver or distribute the material to the user as their request with match quantity and time. The process to arrange and coordinating man and equipment to handle the incoming material, subsequent it's checking, storage, and tracking the material, delivering it to the user, and yet maintaining its safe activities are the milestone that involved in the Warehouse Management. Warehouse Management is one of the basic roles of

Supply Chain Management which shall be integrated with Inventory Management to plan the demand and supply, Procurement to purchase the material with competitive cost, and Logistics to deliver purchased material from its origin to warehouse facility.

The material storage facility owned by company shall be supported by demand-supply analysis to ensure the availability of inventory in place to fulfil the needs of internal users. When the cost to compensate for the shortage of material considered as important and crucial, providing safety stock to anticipate uncertain conditions is one of the solutions. Additionally, maintaining inventory performance shall have the service level of inventory to lower the probability of stock out. These are common strategies taken by most of inventory and warehouse manager in the company to manage stock and material storage. However, gaps in ensuring balance demand-supply sometimes still occur along with the business growth, the various types and numbers of parts, limitation space in the warehouse, and change behaviour in material consumption add more challenges to Inventory and Warehouse Management. The approach to resolve the problems of unbalancing demand-supply is by having good demand planning from the operation and maintenance, also able performing a lean process of supply chain.

To ensure there will be no interruption in operation due to short of inventory material (stock-out incident), managers in operation will defend his operation to secure the production target is by keeping more material under his supervision, not rely on the warehouse. This behavior in a certain period might not significantly impact the company's financial condition. But, when the numbers are growing bigger than what can imagine, then it will lead to catastrophic condition for the company as the cost of working capital may increase without control, improper material storage may happen, and all relevant activity risk as an impact of intention to put operation safer also add complexity to its operation. This kind of behavior will trigger the exitance of shadow inventory or shadow warehouse in the company.

To ensure operational continuity of plant and other facilities, some materials with a certain minimum quantity are needed to be ready in Warehouse. So, if something is broken and needs to repair, then the parts could be found and installed right away. But, the number of stocks should not be excessive to avoid high costs, so it has to have maximum stock available to use. Inventory control is the way how to control the inventory or stock to guarantee the material will always available. On top of that, the company needs to keep the inventory level as low as it can, but in reality not all plans could be executed perfectly. There always a possibility of material consumption change and increase suddenly, there is also a possibility of material delay supply, etc. Therefore, defining the minimum and maximum level of inventory based on history consumption is the safety factor.

2. Problem Identification

Inventory and Warehouse Management in mining companies has different challenges compared to what faced by other companies in the manufacturing industry, especially where its operating area located which considered a remote area. A mining company that has integrated process and inter-correlated each other array from mining, processing plant, power plant, maintenance, and all other supporting works, adds more challenges where it needs good planning on material demand and its supply to ensure continuity of production and reliability of maintenance. Maintaining its balancing between demand and supply requires great effort, attention, and involvement from all stakeholders in each process, fail to meet this will impact to a long backlog and increasing risk of operation for the company.

PTVI has 9 (nine) warehouses under supervision and management of Supply Chain Management Department with has the main purpose to tore required material for company's maintenance, repair, and operation (MRO) activities, these warehouses to keep and store material for all kind of operation and supporting works to mine and process nickel mate, also other related works in supporting the main operation in Sorowako. During the years along with business growth and activities getting complex as the impact of business changes and other improvements, it wasn't aware the condition where shadow warehouse one by one created by the internal user just for anticipation to prepare when material stock-out and not ready to take. Until it was declared as audit finding year ago and deeper comprehensive assessment went thru to identify shadow warehouse existence within the company, and as a result, there are 44 distribution shadow warehouses found in 9 department areas in PTVI as shown in figure 1 below. It needs everyone's attention in the company to address this finding as it has a huge financial impact due to miss-conduct and bad behavior in each step of the operation.

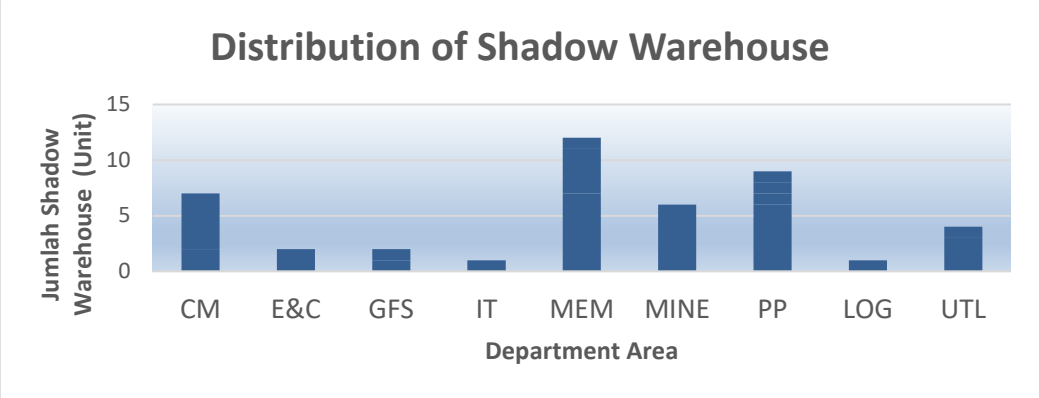

Figure 1. Distribution of shadow warehouse.

During the assessment and communication session with internal users, it realizes that users tried to keep the material in their areas because unsecured feeling due to previous experience where stock-out many times happened and users have to wait requested material too long, meanwhile the operation or maintenance works had been requested to accelerate its completion as it will impact to nickel production and work safety. On the other hand, inventory management has other difficulties setting up the optimum stock parameters because of the lack of material demand planning from users. So, what inventory management does is using a record of historical consumption from previous years, comparison of production level on each year, and total material lead time. All of these will be used to analyze and calculate the safety stock, minimum and maximum level, reorder quantity point, category of stock based on its criticality, etc. These conditions made shadow warehouse findings being more challenging to resolve.
The solution to solve the shadow warehouse is to eliminate all shadow warehouses, centralize the function and bring back the material keep to a warehouse as it is one of the main roles of SCM Dept, not user. Action plan of shadow warehouse elimination will be detailed into several main activities:

- Identify and count the material stored in each shadow warehouses.
- Assess and confirm material necessity, how much and when.
- Put unused material to CMD (Center of Material Disposal) for reselling process.
- Collect and bring back material to Warehouse that to be reutilized.
- Reanalyze stock parameters using a min-max approach/model.
- Define service level and deploy warehouse tools for effective material distribution.

Material is important for the company to ensure its production and operation continuity, material availability needs to be secured at all times based on the level of needs (criticality) and consumption trends. The root cause of shadow warehouse occurrence at PTVI is because of some improper practices within the company:

- Not updated material demand planning, fluctuate consumption for some materials.
- Fluctuating material lead time.
- Changes in maintenance schedule due to the readiness of equipment and its parts.
- Limitation of warehouse spaces.

Because of the above conditions, inventory management fails to calculate the best parameters for each stock because it faces inconsistent variables that affected in overall inventory. After realizing how much material store inside the shadow warehouse and how many materials can be credit back to the warehouse, inventory management shall recalculate the inventory parameters using the Min-Max model to balance the demand-supply of material.

3. Min-Max Method

This paper will research and analyze decisions to be taken by inventory management especially in defining inventory level and its relation to inventory's service level as described in inventory policy and/or annual inventory target using the Min-Max method. Min-Max method is an inventory calculation methodology using the assumption that inventory shall be on 2 levels as designed; minimum and maximum level. When minimum and maximum level has been defined, whenever actual stock in the warehouse bin reaches the minimum level, then it should replenish up to maximum level.

The research subject will be analyzed is limited to stock items that already registered in the inventory database but keep stored by the user in the shadow warehouse. This research has the objective to assist PTVI's inventory management team defining optimum stock parameters to anticipate shadow warehouse occurrences in the future. The researcher will use routine consumption material data (monthly basis), material lead time data, safety stock data, and cost of purchasing as variables to be used in the min-max method. In the end, the study will provide information regarding the stock level in the warehouse sufficient or not.

In this research, data analysis focusses only on material stored in the shadow warehouse. This thesis analyzes and simulates data limited to material stored in the shadow warehouse. Data were taken from identified 44 shadow warehouses. The sample took by random sampling based on material criticality which are criticality A, criticality B, and criticality C, number of the sample used for the analysis of fast-moving and medium moving materials is 30 samples each.

Data of all material movement taken from the period of December 2017 – December 2019, using these below criteria:

1. Quantity data from material in the range of last 2 years.
2. Monthly consumption material from internal users.
3. Material movement type (fast & medium moving).

Steps to analyze the identified problems of this research will be as follows:

- Step 1 – Identification and counting the material stored in each shadow warehouses.
  Collect information on the number of active shadow warehouses operated in the company, and identify material stored in shadow warehouse.
- Step 2 - Collect and return material to inventory/warehouse.
  Based on the result of step 1, then it will be filtered which are inventory items and which are not included as inventory items. For material that not included as inventory items, then SCM encourages users to sign the declaration form to ensure it will not prolong stay in the user's area, it shall part of the user's responsibility to maintain the condition. Material that identified as shadow inventory will return to Warehouse, and then it will register in SAP so it could reutilize by other users.
  In a condition that material already broken/expired OR quantity of material exceed its maximum inventory level, then these materials will be transferred to CMD (Central for Material Disposal) for purposes of reselling or disposal/scrapped.
- Step 3 - Analyze user's consumption behavior.
  Based on the result of step 2, the actual consumption and its movement to be revalidated by the different approach which is interviewing each user that holds shadow warehouse. This information will use to know the expectation of users and how their consumption behavior which indicates the preliminary information of recent inventory service levels.
- Step 4 - Define recent inventory service level.
  Using the target of the company's inventory service level that set up in the inventory policy, then the recent service level shall be defined to seek its correlation with the user's consumption behavior. The result will be compared to the company's inventory service level target.

$$Service\ level = \frac{Quantity\ material\ delivery\ on\ time}{Total\ quantity\ demand\ material} \quad (1)$$

- Step 5 - Analyze stock parameters using a min-max approach/model.
  Based on the targeted inventory service level, then it will use to recalculate the stock parameters by using the Min-Max model which are; safety stock, minimum stock, and maximum stock. The result will be compared to stock parameters that been implemented by the company.

a) Safety Stock (R)
Safety stock is additional stock that purchased to protect or anticipate any possibilities of stock out.

$$Safety\ Stock\ (R) = S_{dl} \times Z \quad (2)$$

where:
S_{dl} : Requisition standard deviation during material lead time

$$S_{dl} = \sqrt{((d^2\ x\ Sl^2)\ +\ (l\ x\ Sd^2)} \quad (3)$$

b) Minimum Stock

The minimum stock/reorder point is the point where the company shall do replenishing the material to fulfilling the material up to the maximum level.

$$Minimum\ Stock: T \times \left(\frac{C}{30}\right) + R \quad (4)$$

c) Maximum Stock
Maximum stock is the maximum level that allows it to be purchased.

$$Maximum\ Stock: \left(\frac{2 \times T \times C}{30}\right) + \mathrm{R} \quad (5)$$

d) Order Quantity
Maximum stock is the maximum level that allows it to be purchased. Order quantity is the number to be purchased to replenish the material up to the maximum level. Whenever inventory reaches the minimum level, then the company shall reorder the material the number shall equal to the request

$$Q = \text{Max Stock} - \text{Min Stock} \quad (6)$$

e) Average Inventory Level (I)
The average inventory level is the average of stock that will store in the company's warehouse in each counting period.

$$I = R + Q/2 \quad (7)$$

f) Inventory value
Inventory value is the cost spent by the company to purchase the material.

$$\text{Inventory value} = \text{Average Inventory Level x Price per unit of material} \quad (8)$$

4. Result

4.1. Fact-Finding

Based on a survey by SCM, it found active shadow warehouse are 44 shadow warehouses which operated in 9 departments. The material identified in the shadow warehouse is the material left over from the capital project and operational development projects (CAPEX and OPEX) that are not returned to the warehouse or material for MRO (Maintenance Repair Operation) activities that are not utilized or leftover from repair/maintenance work (excess material) by the maintenance department with fast and medium moving material movements for material criticality A, criticality B, and criticality C. The distribution of the material store in the shadow warehouse is shown below Table 1.

Table 1. Material distribution in shadow warehouse.

Movement	Criticality A	Criticality B	Criticality C
Fast	2	9	133
	5	4	21
	10	10	41
	7	0	15
Medium	0	2	20
	1	3	11
	1	10	13
	0	1	10
TOTAL	**26**	**39**	**264**

4.2. Pre-identified Caused

Reasons why user keep the material in their areas as follows:

- Critical for their operation, need always ready close to them to avoid production stop.
- To secure their work plan will not delay due to short of material (stock out).
- Can't be stored in the warehouse due to several reasons (i.e. require larger space, require special handling, project delay/cancel, etc.) which most of the material are non-stock items.

4.3. Stock Parameters as per Min-Max model

To get an overall figure of how stock parameters are set by the company and have a clear understanding of related user behaviour, stock parameters of material that have been stored in the shadow warehouse will be analyzed.

As per the above tables, both minimum level and maximum level set by the company have a higher quantity than stock parameters that resulted from Min Max model calculation. Meaning that higher parameters could not increase inventory service level, and lower inventory service level is the basic reasons why shadow warehouse occurred. The stock parameter comparison of the fast-moving material and medium moving material store in the shadow warehouse is shown below Appendix A.

4.4 Service level

To have a whole picture of service level performance, then it shall be compared to service level target and/or service level standard.

Table 2. Comparison of company service level values with standard service levels.

Criticality	Average Inventory Service Level (Dec 2017 – Dec 2019)	Inventory Service Level Target	Service Level Standard
Criticality A	98%	98%	96% - 98%
Criticality B	78%	91%	91% - 95%
Criticality C	87%	88%	85% – 90%

As per the above table, criticality B material still below the target, meanwhile material with criticality A already meet the target. Therefore, stock parameter calculation using the Min-Max model will only focus on material with criticality B dan C. Lower service level could be caused by 2 (two) reasons which are both of them influenced by internal and external factors of the company.

1. Low stock availability in warehouse or low stock on hand.

If stock parameters already set in optimum numbers, then low stock availability might be caused by unfavourable lead time of processing reservation to Purchase Requisition (PR) where Inventory Management oblige to forecast and calculate the needs of parts compare to stock in hand which its creation of PR shall refer to stock parameters. Delay or miss-calculating when and how many quantities shall be considered in PR might impact to lower stock availability in the warehouse. The continuation of PR is issuing PO (Purchase Order), process of sourcing and awarding the order to the supplier have a significant contribution to stock availability. Delay in finding information of correct material and supplier might lead to condition of stock out or low stock availability. Other than those causes, process lead time of activities within warehouse also might impacting delay to realize the stock availability in storage bin. Those 3 causes are happened in internal of company, therefore set the target of lead time of each process is important to identify and mitigate any abnormalities in the process.

Low stock availability could also be caused by external factors which these causes might triggered by supplier performance, delivery process from suppliers to company's warehouse and condition where material discrepancies happened during receiving process. These external factors shall be monitored by the company, mitigation action shall be taken when potential delay could be identified in advance.

2. Delay delivery service to a user

If material already available in the warehouse, but the material could not deliver on time as requested, then it might be caused by processes which happened inside warehouse. Longer lead time of the warehouse to pick the material from storage bin to delivery bay could have rolling impact to delivery of material to user. This potential delay might result from lack number of people and/or lack knowledge of people and/or readiness of equipment.

The warehouse shall have detail control to ensuring all warehouse's activities operate without interruption.

- The unfavourable lead time of warehouse.
- Lack of delivery resources.
- Lack of knowledge of storeman in the warehouse.

Those root-causes shall be thoroughly investigated and analysed to realize the bottom of problems. This paper intended to know the correlation between correctly setting stock parameters and action to be taken to avoid shadow warehouses in the future.

However, to take advantage of stock parameters analysis that been calculated using the Min-Max model, below is potential savings/cost avoidance from the adjustment of stock parameters. By having these potential savings/cost avoidance calculations, the company might consider the benefit of adjusting the stock parameters in the correct level which more optimum compares to level that already set higher without realizing service level target, or controlling and mitigating the low stock availability and on-time delivery service to user.

Analysing and calculation total cost of inventory by using Min-Max method able to provide optimum stock parameters which lead to cost efficiency for the company. This kind of analysis is very crucial for the company to know inventory optimum level, the calculation is by converting the forecasted inventory average then times to unit price of material. The results of calculating the saving cost for fast moving and medium moving materials are described in Appendix B.

The minimum stock level should be the same with the reorder point, which is at this point the buyer should order to replenish the stock. This level stock value describes the consumption of material to accommodate lead time. When the average usage value of each month greater, it will be following by greater minimum inventory value. The average usage value also impacted to safety stock value. Safety stock value in this calculation describes an extra that should be added to the inventory stock level. Otherwise, the maximum stock level has shown the maximum quantity of materials allowed for inventory. The quantity of maximum stock level is influenced by order quantity and usage of material during lead time. The result of the Min-Max method calculation gives a positive impact on the material inventory efficiency, inventory value will decrease and decrease the stockout number.

5. Conclusion

In this study, we address the inventory problem in one mining company in Indonesia. The existing situation with many inventory locations results in duplicated inventory and hence causes inefficiency. We have proposed centralization of inventory location and then use the (Min-Max) inventory control model. The impacts of the proposed control model on the cost and service level were assessed. The results show that by centralizing inventory and use the (Min-Max) control model, there is a potential cost saving without any decrease in service level. As expected, most savings are contributed by the materials categorized as fast moving. However further works are needed to more deeply understand the characteristics of materials that has more saving potentials so that the management could focus on those type of materials.

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Appendix A

Table A1. Stock parameter comparison of fast moving material.

Stock code	Criticality	Min Level Set by Company	Min level as per calculation	Max Level set by Company	Max Level as per calculation
15108408	Criticality B	297	271	463	380
15105663	Criticality C	450	281	546	412
15116648	Criticality B	385	362	496	449
15116609	Criticality C	82	68	107	72
15117764	Criticality C	46	39	59	46
70240019	Criticality C	267	241	478	395
15081621	Criticality C	305	222	372	251
15082066	Criticality A	3566	2647	4695	4540
15098133	Criticality C	41	29	58	45
15097925	Criticality C	71	38	84	42
15115576	Criticality A	231	201	255	250
15114096	Criticality A	158	140	183	167
15117139	Criticality A	65	30	68	42
15117798	Criticality C	526	373	720	581
15115561	Criticality A	21	17	35	19
15097923	Criticality C	156	101	202	169
15115559	Criticality A	183	125	246	159
15162871	Criticality B	793	602	994	906
15079637	Criticality A	197	129	213	211
15117446	Criticality A	905	876	1099	972
15115477	Criticality C	1174	474	1566	785
15080071	Criticality B	214	91	230	148
15114137	Criticality B	837	666	1692	1014
15116591	Criticality C	571	386	818	538
15087576	Criticality C	300	142	500	225
15087574	Criticality C	300	147	500	170
70150104	Criticality C	2062	1136	2945	1896
15117172	Criticality C	1312	699	1684	1085
15084628	Criticality C	2934	2367	4175	4112
15115642	Criticality A	2987	1683	3000	2594

Table A2. Stock parameters comparison of medium moving material.

Stock code	Criticality	Min Level Set by Company	Min level as per calculation	Max Level set by Company	Max Level as per calculation
15081596	Criticality B	93	84	148	88
70158044	Criticality C	103	88	250	95
70204014	Criticality C	76	65	91	68
70117285	Criticality C	321	279	439	292
70158041	Criticality C	83	66	136	69
70245882	Criticality C	77	26	96	40
15079212	Criticality B	9	4	17	5
15116681	Criticality C	12	7	27	9
15114164	Criticality C	23	11	28	15
15114212	Criticality C	84	24	94	35
70245881	Criticality C	180	43	300	65
70245881	Criticality C	180	41	300	63
70160088	Criticality B	227	206	376	214
15117490	Criticality C	40	25	41	35
15079665	Criticality C	43	22	47	33
15117491	Criticality C	79	27	83	39
15162883	Criticality B	178	86	178	139
70145934	Criticality B	28	12	51	13
15080037	Criticality C	36	21	47	26
15114140	Criticality C	15	8	17	12
15115641	Criticality C	95	34	113	48
70158044	Criticality C	106	89	176	95
15079215	Criticality C	6	3	12	4
15115558	Criticality B	9	4	27	5
15080078	Criticality C	3	1	4	2
15079677	Criticality C	39	30	63	43
15083660	Criticality C	20	12	40	17
15071719	Criticality C	62	46	79	62
15087575	Criticality C	300	283	500	389
15107515	Criticality C	290	273	500	375

Appendix B

Table B1. Savings/cost avoidance from fast moving material.

Stock code Material	Inventory Level		Inventory Value	
	Company	Min-Max	Company	Min-Max
15108408	271	216	$ 17,711.15	$ 14,138.01
15105663	367	215	$ 194.41	$ 114.08
15116648	354	319	$ 4,071.67	$ 3,669.51
15116609	91	67	$ 3,223.80	$ 2,363.15
15117764	45	35	$ 6,889.98	$ 5,371.62
70240019	219	164	$ 2,954.53	$ 2,217.55
15081621	310	208	$ 5,503.07	$ 3,691.68
15082066	2237	1700	$ 97,039.37	$ 73,744.50
15098133	33	21	$ 409.26	$ 256.27
15097925	73	36	$ 334.21	$ 164.43
15115576	193	176	$ 3,626.70	$ 3,297.86
15114096	144	127	$22,212.04	$ 19,589.09
15117139	54	23	$104,877.8	$ 45,336.82
15117798	415	269	$1,899.99	$ 1,230.85
15115561	26	15	$ 2,344.46	$ 1,403.91
15097923	111	67	$ 401.31	$ 242.40
15115559	181	108	$ 6,923.36	$ 4,137.49
15162871	590	450	$ 3,643.66	$ 2,778.88
15079637	123	88	17,109.67	$ 12,263.76
15117446	906	828	$15,604.19	$ 14,263.43
15115477	1059	319	$ 1,906.00	$ 573.58
15080071	165	62	$10,445.93	$ 3,949.46
15114137	916	492	$ 9,151.12	$ 4,912.30
15116591	542	310	$ 2,912.09	$ 1,663.19
15087576	317	100	$11,098.40	$ 3,514.92
15087574	377	135	$62,150.00	$ 22,321.75
70150104	1743	756	$ 1,464.37	$ 634.96
15117172	1112	506	$ 4,358.04	$ 1,982.27
15084628	1809	1494	$ 3,202.78	$ 2,644.94
15115642	2082	1227	$ 69,303.29	$ 40,850.06

Table B2**.** Savings/cost avoidance from medium moving.

Stock code Material	Inventory Level		Inventory Value	
	Company	Min-Max	Company	Min-Max
15081596	117	83	$2,321.57	$1,640.04
70158044	170	85	$1,020.58	$511.66
70204014	81	63	$145.08	$114.06
70117285	368	273	$2,021.25	$1,502.23
70158041	107	65	$27.71	$16.81
70245882	73	20	$1,185.04	$317.58
15079212	12	3	$1,112.06	$304.35
15116681	18	6	$35.13	$11.97
15114164	22	9	$228.41	$97.62
15114212	78	19	$759.78	$181.19
70245881	218	32	$3,279.02	$475.74
70245881	218	30	$3,279.02	$444.29
70160088	293	202	$19,377.51	$13,313.39
15117490	30	19	$2,800.30	$1,801.90
15079665	34	16	$946.05	$463.46
15117491	69	21	$3,593.14	$1,083.51
15162883	125	60	$1,330.08	$632.65
70145934	39	12	$7,608.25	$2,388.61
15080037	36	18	$1,085.20	$538.90
15114140	13	7	$63.90	$33.49
15115641	90	27	$3,775.13	$1,116.84
70158044	135	85	$807.58	$512.06
15079215	8	2	$597.95	$188.99
15115558	17	3	$7,079.76	$1,457.51
15080078	3	1	$331.46	$130.89
15079677	38	23	$3,337.16	$2,045.08
15083660	25	9	$2,511.11	$924.04
15071719	55	38	$270.97	$189.53
15087575	293	230	$10,271.3	$8,039.24
15107515	293	222	$10,260.83	$7,773.89

- Inventory value of fast moving reduce amount USD 199,644.01.
- Inventory value of medium moving amount USD 43,210.82.

Total savings/cost avoidance might realize for the company is USD 242,854.83.