

Inventory Optimization at Apollo Diagnostics

By

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*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

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The IIHMR University, Jaipur

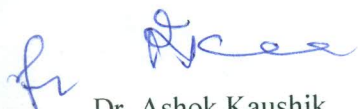
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TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr. Megha Maladhari** student of MBA Hospital and Health Management from The IIHMR University, Jaipur has undergone dissertation training at **Apollo Health Lifestyle Limited** from February 15th 2016 to April 30th 2016.

The Candidate has successfully carried out the study designated to her during dissertation training and her approach to the study has been sincere, scientific and analytical. This training is in fulfillment of the course requirements.

I wish her all success in all future endeavors.



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TO WHOM IT MAY CONCERN

I write to confirm that **Dr. Megha Maladhari** was placed at **Apollo Health and Lifestyle Limited** for her project. She worked on the project entitled **“Inventory Optimization”** at Apollo Diagnostics, Hyderabad from 15.02.2016 to 30.04.2016. She has been innovative in developing the concepts and working structure for the project, and sincere in her attempt to complete the task with attention to detail. She has also made a brief report about current process and standard process of the industry.

Place: Hyderabad

Date: 30/4/16.

Signature of the External Guide

(With stamp)

😊
All the best

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **A study on Inventory Optimization at Apollo Diagnostics** and submitted by **Dr. Megha Maladhari** Enrolment No. **2014-2016/0167** under the supervision of **Dr. Nutan P. Jain** for award of Postgraduate Diploma in Hospital and Health Management of the University carried out during the period from **15/2/2016 to 30/4/2016** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.



Signature

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Success of an individual is possible when a person is being supported and promoted by good people

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THANK YOU ALL

Dr. MEGHA MALADHARI
(Management Trainee)

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INTRODUCTION:

Inventory or **stock** refers to the goods and materials that a business holds for the ultimate purpose of resale (or repair).

Inventory management means properly maintaining of adequate stocks to ensure uninterrupted services. It is the active control program which allows the management of usage, purchases and payments to precede the regular and planned course of production and stock of materials. Control Inventory method helps to Organize and manage Budget and Promotes good understanding and the capacity to control financial costs.

Laboratory Inventory includes the supplies and materials need for all lab performance. Laboratory inventory management ensures availability of materials and kits when needed, avoids the use of expired kits and minimizes wasting components

Successful purchasing and inventory management requires policies and procedures be established for managing all critical materials and services. Some of the key components to address are:

- Vendor/manufacturer qualifications; Selecting vendors and understanding the considerations
- Purchase agreements consideration
- Implementing an Inventory Management Program by establishing Implementation steps
- Receiving, inspecting, testing, storing, and handling of materials; all purchased material should be inspected and appropriately tested to ensure

those specifications are met. Policies should be established for storing and handling materials as they are delivered to the laboratory.

- Tracking materials to individual patients; the management system must allow for tracking materials to individual patients; that is, the laboratory should be able to identify specific test materials used for performing tests on any given day, so that if there is a problem with a patient result, the laboratory will know what reagents were used.
- analyzing the needs for materials for determining how many kits for a particular test should be on hand
- Consumption-based and morbidity based quantification
- Assessing and maintaining inventory
- Developing forms, logs and logbook
- Receipt and Storage of Supplies
- Organization of shelves
- Labelling reagents
- Controlling expiration periods
- Dispatching supplies to satellite laboratories

PROCESS FLOW OF MATERIAL:

Indent for the requirement of material and consumables raise by Lab Manager on Material Requisition form (MRF) by considering stock in hand, orders pending vis-à-vis quantity required by the Departments



After receipt of requirement intimation from Labs, Assistant Manager (AM) warehouse & Logistics assess the quantity of various types of materials required to be procured and Approves or Rejects the Indent in INSTA Software and then after send that indent to the Procurement Team for issuing of Purchase Order



Procurement Team forwards the Indent to the Purchase Team for further processing of dealing with the Vendors for the respective Items



On arrival the Material at Lab's Gate, Lab Manager verifies Vendor Invoice with Purchase Order to ensure the accuracy specification, quantity, quality of material and only after that, material will be allowed to enter in stores premises. Then security guard maintains entry of materials in Material Inward Register



- In case quantity found short, intimation will be given to vendor and quantity actually received will be marked on Vendor Invoice and PO.
- Excess quantity will not be accepted and will be returned back to vendor. Intimation will be given by the stores to the Vendor and Purchase Section regarding excess quantity received.
- In case of part delivery by vendor, notation will be made on the reverse of Purchase Order and Purchase Order will be marked as close only when entire quantity of material is received.



After Receiving and verification of Material with PO & Invoice, Laboratory Name Stamp on Invoice with signature & date is maintained and entry for the same will be made in INSTA software by store executive and Goods Receipt Note (GRN) will be generated. At last verification will be done by the Lab Manager



After this, Lab Manager Segregates the materials as per their storage instructions and specifications and tagged them with their identification details, department of uses and receipt date

REVIEW OF LITERATURE:

In the study on “Management of Laboratory Reagent Supplies in the Dominican Republic Ministry of Health”, during the second half of 2013, the UNGM, with support from SIAPS, conducted a rapid study to determine the availability and consumption of laboratory reagents, so they could be included in future programming for the joint national purchase. The sample included 26 clinical laboratories: 11 located in national referral specialized care centres. A total of 99 types of tests, both manual and automated, were studied, in seven diagnostic areas. At the time of the study, 9 percent of manual tests were not being performed because of a lack of reagents. The principal causes of this shortage were the lack of availability of the required product at PROMESE/CAL and the inability to purchase on credit from private suppliers because of accumulated debt. Of the laboratories evaluated, 31 percent were forced to stop conducting some of the manual tests during the three months preceding the study because of a lack of reagents.

A study on ‘Rapid diagnostic test supply chain and consumption study in Cabo Delgado, Mozambique: estimating stock shortages and identifying drivers of stock-outs’ was conducted by Hasselback L, Crawford J, Chaluco T, Rajagopal S, Prosser W, Watson N. This is the first study of its kind to evaluate stock shortages of malaria RDTs in a developing country setting. This study reveals important findings on drivers of lost consumption and stock shortages. Health facilities reported significantly high levels of lost consumption due to stock-outs, with an average of 78%. In addition, higher levels of the lost consumption rate were found to be associated with facilities that observed higher monthly consumption. On average,

the health centres in this study stocked out of RDTs roughly 50% of the time during the eight-month study period.

A study on ‘Reagent and laboratory contamination can critically impact sequence-based microbiome analyses’ by Susannah J Salter, Michael J Cox, Elena M Turek, Szymon T Calus, William O Cookson, Miriam F Moffatt, Paul Turner, Julian Parkhill, Nicholas J Loman and Alan W Walker demonstrate that contaminating DNA is ubiquitous in commonly used DNA extraction kits and other laboratory reagents, varies greatly in composition between different kits and kit batches, and that this contamination critically impacts results obtained from samples containing a low microbial biomass. Contamination impacts both PCR-based 16S rRNA gene surveys and shotgun metagenomics .

In the study ‘Reagent Carryover Studies: Preventing Analytical Error with Open Clinical Chemistry Systems’ by Joseph Boneno, Michelle Fokakis, Dave Armbruster, Dixon classified carryover in selective access analyzers as physical (specimen) carryover or chemical (reagent) carryover and proposed formulae for quantitating both types.^[3] Brenna and Prencipe described studies to characterize specimen carryover, reagent cross contamination, and cuvette-related carryover on the Bayer Axon for 12 analytes. Out of these, reagent cross contamination was found to be statistically significant. Schlain and colleagues evaluated interassay carryover (reagent cross contamination) biases on the Abbott AxSYM .They used a 2-stage approach to examine a total of 231 possible assay pair configurations. In the first stage, those assay pairs that did not demonstrate carryover biases were eliminated from further consideration and in the second stage, those assay pairs could potentially result in large carryover biases were studied further.

Their statistical model involved constructing 95% confidence intervals for test results from assay pair interactions. If the observed carryover bias was contained within the defined confidence interval, it was considered not to be either statistically or clinically significant. Increasing pipettor probe wash volumes was found to be an effective means of controlling carryover.

RATIONALE:

Laboratory inventory management is a critical, or essential, component of the quality management system. Efficient and cost-effective laboratory operations need the uninterrupted availability of reagents, supplies, and services. Inability to test, even for a short time, is very disruptive to clinical care, prevention activities, and public health programs.

Careful management of inventory helps to prevent waste, which can occur if reagents and supplies are stored improperly, or if reagents become out-dated before they can be used. Establishing a purchasing and inventory management program will ensure that:

- Supplies and reagents are always available when needed;
- High quality reagents are obtained at an appropriate cost;
- Reagents and supplies are not lost to improper storage or kept and used beyond expiration.

RESEARCH QUESTIONS:

1. What is the current Approval turn around time, Purchase order raised turn around time and Delivery turn around time of items used in routine laboratory tests at Apollo Diagnostics? If any delay, then mention reasons.
2. What are the different methods for optimizing the Start up laboratory budget?
3. What are the fast moving as well as maximum budget consuming items at Apollo Diagnostics?

AIM OF THE STUDY:

To increase efficiency of Inventory Management process at Apollo Diagnostics

OBJECTIVES:

1. To study the Approval Turn Around Time, Purchase order raised Turn Around Time and Delivery Turn Around Time of items used in routine laboratory test and its gaps.
2. To optimize the Start up laboratory budget
3. To analyze stock movements in the store and to classify the items on the basis of their consumption value and movement

RESEARCH METHODOLOGY:

The study was conducted during the period of 3 months; February to April 2016 from The Apollo Diagnostics, Hyderabad. The Study Area is Satellite Lab store (SL), Regional Reference Lab store (RRL), Regional Lab store (RL), Hospital Lab store, Patient Care Centre Store (PCC), warehouse.

This is an analytical study which included analysis of all items (965items) which were used to perform Routine tests in laboratories such as Biochemistry, Hematology, Clinical Pathology, Cytology, Histopathology, Immunology, Microbiology, Molecular Genetics, Molecular Diagnostics, Serology as these routine tests contribute nearly seventy five percent of business of Apollo Diagnostics as per HMIS data.

DATA COLLECTION TECHNIQUES:

The primary data was collected using the following methods:

- Observation checklist was used to observe the reasons for delay in Approval TAT, PO Raised TAT, Delivery TAT, item wise consumption and stock movements of items
- In depth Interview was conducted with 53 of staff including Head of Diagnostics(1), Assistant manager of Laboratory and warehouse(1), Procurement Executives (2), Pathologists (14), Quality head(1), Store Incharges (23), and Patient Care Centre Incharges (12)

SECONDARY DATA was collected by:

- Reviewing the records using data sheet. The data were collected from Hospital Management Information System (INSTA software) and laboratory instrument
- Reviewing Standard Operative Procedures (SOPs) and guidelines of Apollo Diagnostics
- Reviewing Email Communication during the period of of 3 months; February to April 2016

Inventory control had done by following methods by removing extra items, by optimizing item wise consumption per test, by changing vendors with high items price ,by negotiating with same vendors to decrease the item price and following inventory categorization methods,(i) ABC Analysis, (ii) FSN Analysis, iii)ABC- FSN Matrix

OBSERVATIONS AND FINDINGS:

Objective 1: To study the Approval Turn Around Time, Purchase order raised Turn Around Time and Delivery Turn Around Time of items used in routine laboratory test and its gaps.

Methodology:

Intern had find out the following Turn Around Time of items used in routine laboratory test both Location and Item wise, to find out exact reasons for the delay.

A) Approval TAT(In days) = Approved date – Indent Date

B) Purchase Order Raised TAT(In days)

= Purchase Order Raised date – Approved date

C) Delivery TAT (In days)

= Goods Received Note date – Purchase Order Raised
date

Location wise Turn Around Time:

We had taken data for last 3 months (January, February and March) which includes, Item name, Location name, Vendor name , Indent date, Approved date, Purchase order (PO) raised date, Goods received note date and By the above formula, we had calculated Approval TAT, PO Raised TAT and Delivery TAT of items and we had considered only those locations which were having higher Turn Around Time than standard time.

Item wise Turn around Time:

We had taken data for last 3 months (January, February and March) which includes, Item name, Location name, Vendor name , Indent date, Approved date, Purchase order (PO) raised date, Goods received note date and By the above formula, we had calculated Approval TAT, PO Raised TAT and Delivery TAT of items .

As, One item will be supplied in different locations, So to calculate item wise TAT, We had taken average of Approval TAT, PO raised TAT and Delivery TAT for each item (as mentioned below) and at last we got total 345 items TAT list . Out of those, we had considered only those items which were having higher TAT than standard time.

A) DELAY IN APPROVAL TURN AROUND TIME (In days)

Methodology:

As per Standard Operative Procedures and guidelines of Apollo Diagnostics, The Standard Approval TAT was 3 days.

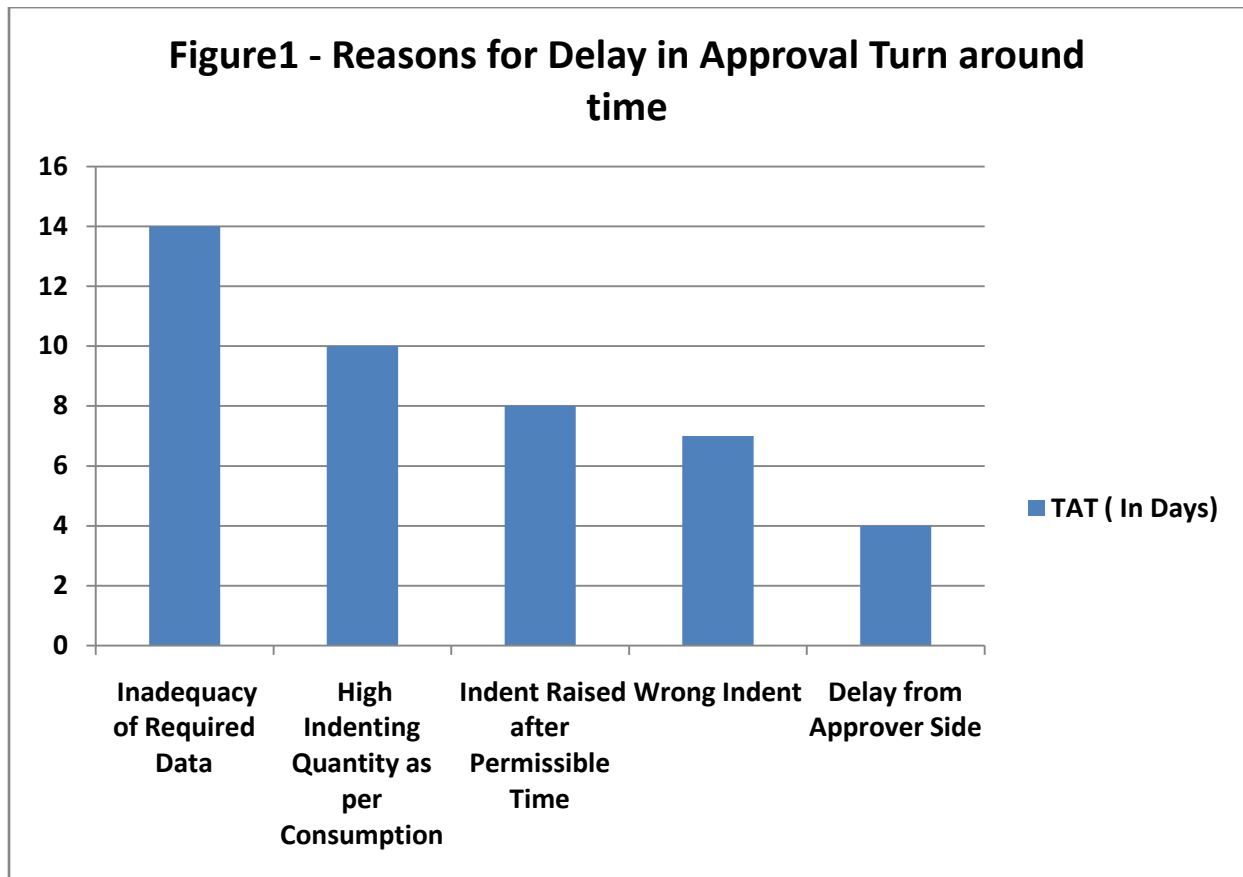
So to find out the Delay in Approval TAT, We had taken data of all 345 items from item wise TAT list and out of those, we had selected those items, which were having Approval TAT more than 3 days

(Source- SOPs of Lab store Department and Data from Insta Software)

So We observed that,

Out of 345 Items, 57 Items (16%) had Approval TAT <u>more than 3 days</u>

The Reasons for Delay in Approval Turn Around Time (TAT) are as follows:

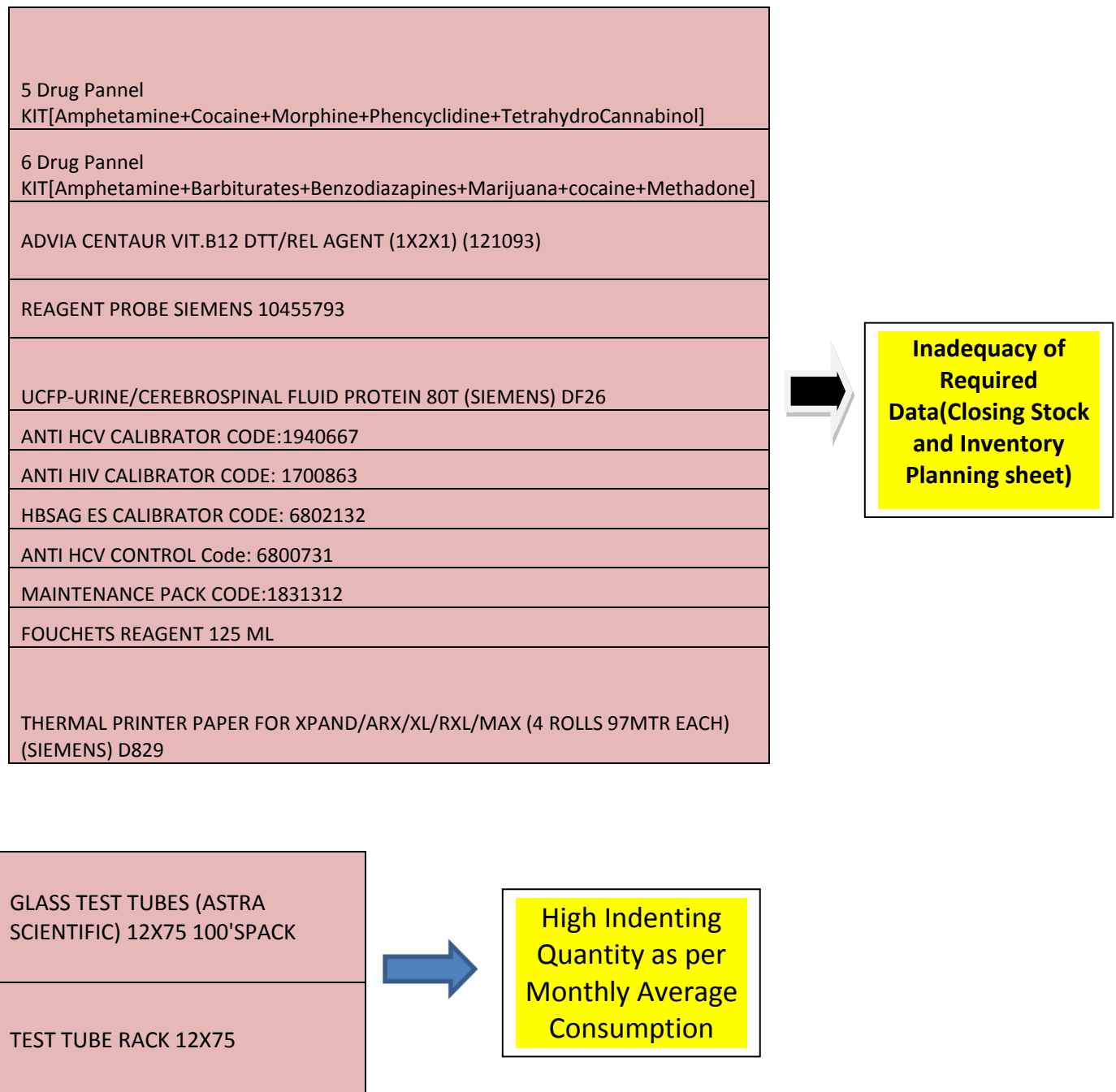


(Source- Data from Email communication)

Reasons for Delay in Approval TAT	Inadequacy of Required Data(Closing Stock and Inventory Planning sheet)	High Indenting Quantity as per Monthly Average Consumption	Indent Raised after Permissible Time	Wrong Indent	Delay from Approver Side
TAT (In Days)	14	10	8	7	4
Item Count	12 Items	2 Items	1 Item	16 Items	26 Items

The respective items which were having Approval TAT more than 3 days are as follows:

Figure 2: shows items and reasons which were having Approval TAT more than 3 days



RHELAX CRP 100T
(TULIP)



**Indent Raised after
Permissible Time**

ANTI HCV 100'S PACK CODE: 1318450

HBSAG CONTROL CODE:6800598

SIGNAL REAGENT CODE:1072693

ADVI CENTAUR FT4 250T- Code : 10282219

ANTI-HIV 1/2 CONTROL CODE: 6800586

Double Distilled Water 5ltr

UNIVERSAL WASH RGT CODE: 8389793

WIDAL (TULIP) 4X5ML

ESTRADIOL REAGENT PACK (CAT NO:110784), 1X
100T-SIEMENS

Combur 10M test 100Strips Make:ROCHE

ADVIA CENTAUR FERRITIN Code:110745 Siemens
50's Pack

ADVIA CENTAUR FT3 Code:119780 Siemens 50's
Pack

ANCILLARY PROBE WASH Code:02416113
Siemens 2x25 mL's Pack

PROGESTERONE (CAT NO:118530), 1X50 T-
SIEMENS

Snap Pack 03112349. Make : Roche

HBsAg (SD)30T



**Wrong
Indent**

ADVIA CEN T3/T4/VB12 ANC RGT Code:110329 Siemens 6x25 mL's Pack
ANTI HIV 1+2 REAGENT 100'S PACK CODE:1241850
ALB-ALBUMIN 480T (SIEMENS) DF13
AP PREGNACY TEST CARD
BARCODE LABEL STICKERS (2 "x 1") - 2000 Per Roll
BLOOD GROUPING KIT (ERYSCREEN). 3X12ML
CA-CALCIUM 480T (SIEMENS) DF23A
FACE MASK
Long Register 300Pgs Ruled
SAMPLE CUPS WITH LIDS 1.5ML (SIEMENS) DSC4 1000'SPACK.
SODIUM CHLORIDE 500GM
Stapler Pin No.10 Kangaroo
ALP-ALKALINE PHOSPHATE 360T (SIEMENS) DF15A
TP- TOTAL PROTEIN 480T (SIEMENS) DF73
TBI- TOTAL BILIRUBIN 480T (SIEMENS) DF167
MALB CALIBRATOR 6X2.0ML (SIEMENS) DC114
ABX EOSINOFIX (1 LTR)
BLOOD UREA NITROGEN (BUN) - 5*60T- 8102204
CHOL-CHOLESTEROL 480T (SIEMENS) DF27
CREA-CREATININE 480T (SIEMENS) DF33A
GGT-GAMMA GLUTAMYL TRANSFERASE 288T (SIEMENS) DF45A
GLU-GLUCOSE 1440T (SIEMENS) DF40
HIV (TRIDOT) J.MITHRA 100'spack.
PHOSPHOROUS (PHOS) - 5*60T- 1513209
TBI/DBI CALIBRATOR 6X1.0ML (SIEMENS) DC167
TOTAL PROTEIN (TP) - 5*50T- 8392292



**Delay from
Approver Side**

We had find out those Locations which are having Approval TAT more than 3 days both Location wise and Item wise.

Table 2 : shows locations with Item Wise High Approval TAT	
Out of 57 Items	Location name
14 items	Bowenpally Regional Lab
9 items	Coimbatore Satellite Lab
24 items	Indrapuram
6 items	Kondapur Regional Lab
1 item	Vizag Satellite Lab
2 items	Viman Nagar Regional Lab
1 item	Koramangala Regional Lab

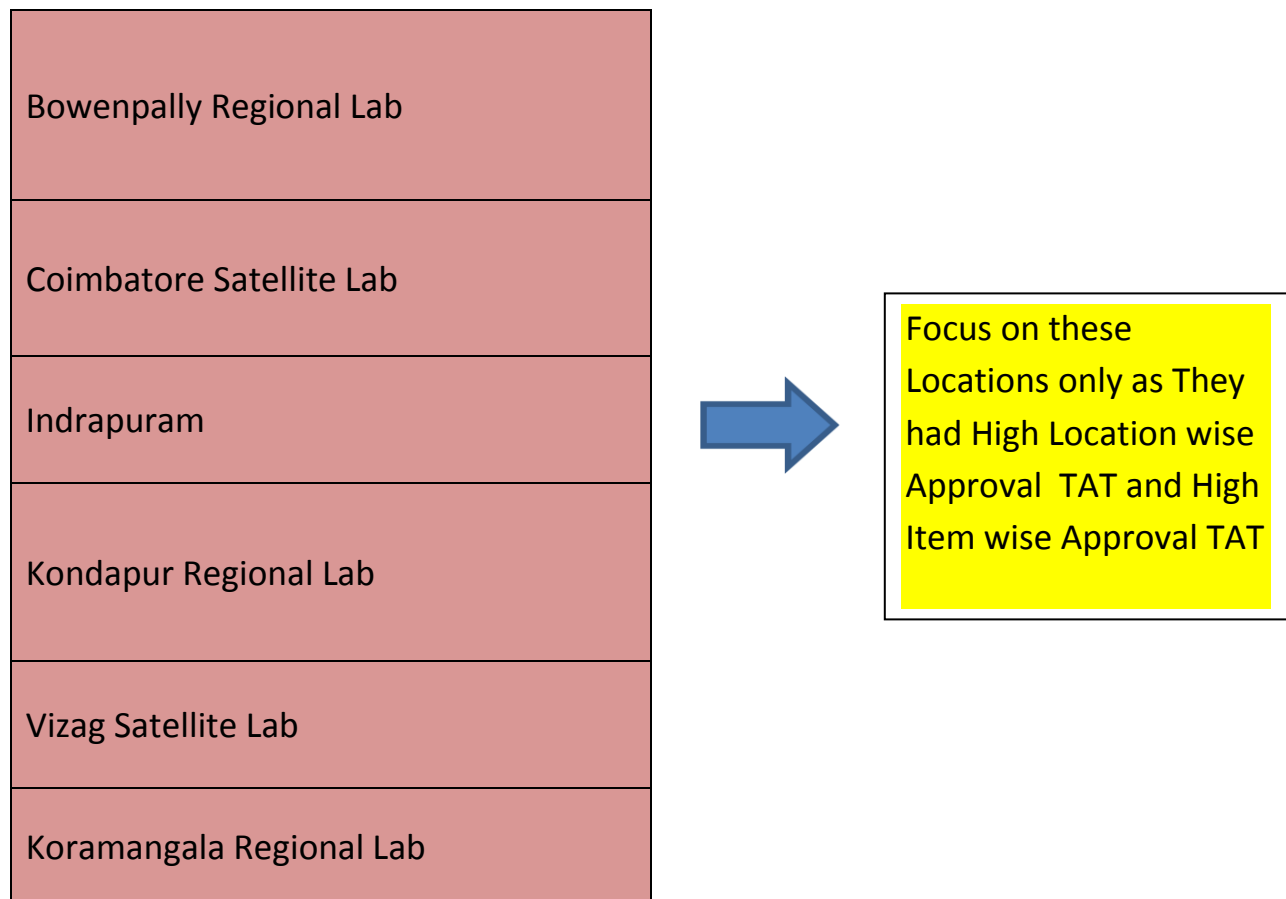
(Source- Data from Item wise TAT list)

Table 3 shows locations with location Wise High Approval TAT
Bowenpally Regional Lab
Coimbatore Satellite Lab
HLM Deepam
Indrapuram
Kondapur Regional Lab
Koramangala Regional Lab
Mysore Regional Lab
Vizag Satellite Lab

(Source- Data from Location wise TAT list)

Out of these locations, We had taken only those common locations which were having Approval TAT more than 3 days both Location wise as well as Item wise to focus on exact reasons for the delay in Approval TAT.

Figure 3 : shows those common locations which were having Approval TAT more than 3 days both Location wise as well as Item wise



Conclusion:

- Due to Inadequacy of Required data (Closing Stock and Inventory Planning sheet), there is highest Approval TAT of 14 days. So, Indent should be raised with adequate data from the respective locations.
- Due to High Indenting quantity as per Monthly Average Consumption, there was Approval TAT of 10 days. So, Indent should be raised In accordance with Monthly Average Consumption from the respective locations.
- Due to delay in monthly Indent, there was Approval TAT of 8 days. So, Indent should be raised within Permissible Time from the respective locations.
- Due to wrong Indent, there was Approval TAT of 7 days. So raised Indent from the respective locations should be correct.
- Due to delay from Approver side, there was Approval TAT of 4 days. So, Indent should be approved on Time by the Approver.

B) DELAY IN PURCHASE ORDER (PO) RAISED TURN AROUND TIME (In days)

Methodology:

As per Standard Operative Procedures and guidelines of Apollo Diagnostics), The Standard Approval TAT was 3 days.

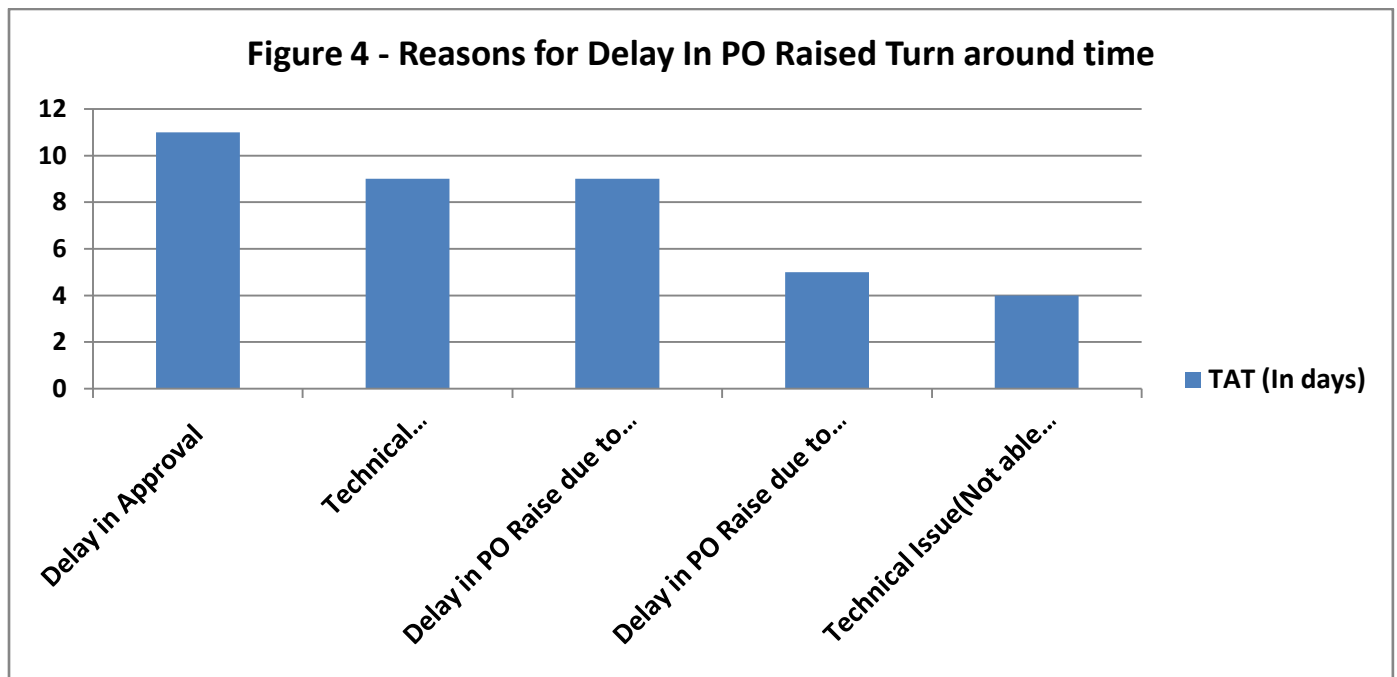
So to find out the Delay in PO Raised TAT, We had taken data of all 345 items from item wise TAT list and out of those, we had selected those items, which were having PO Raised TAT more than 3 days

(Source- SOPs of Lab store Department and Data from Insta Software)

So We observed that,

Out of 345 Items, 24 Items (7%) had PO Raised TAT more than 3 days

The Reasons for Delay in Purchase Order Raised TAT are as follows:

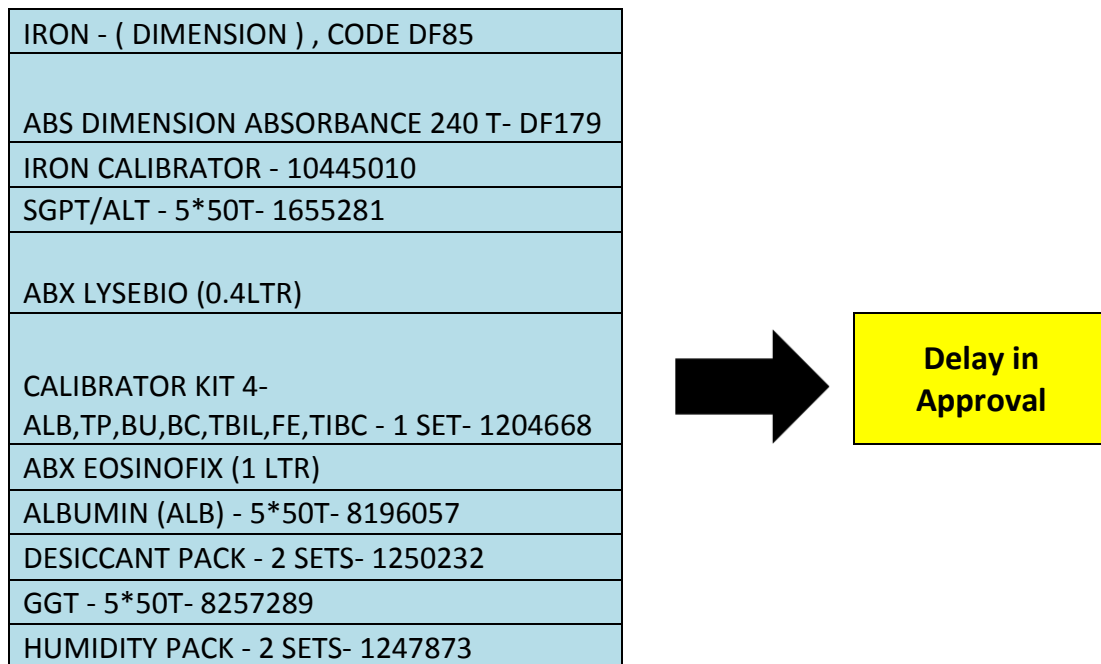


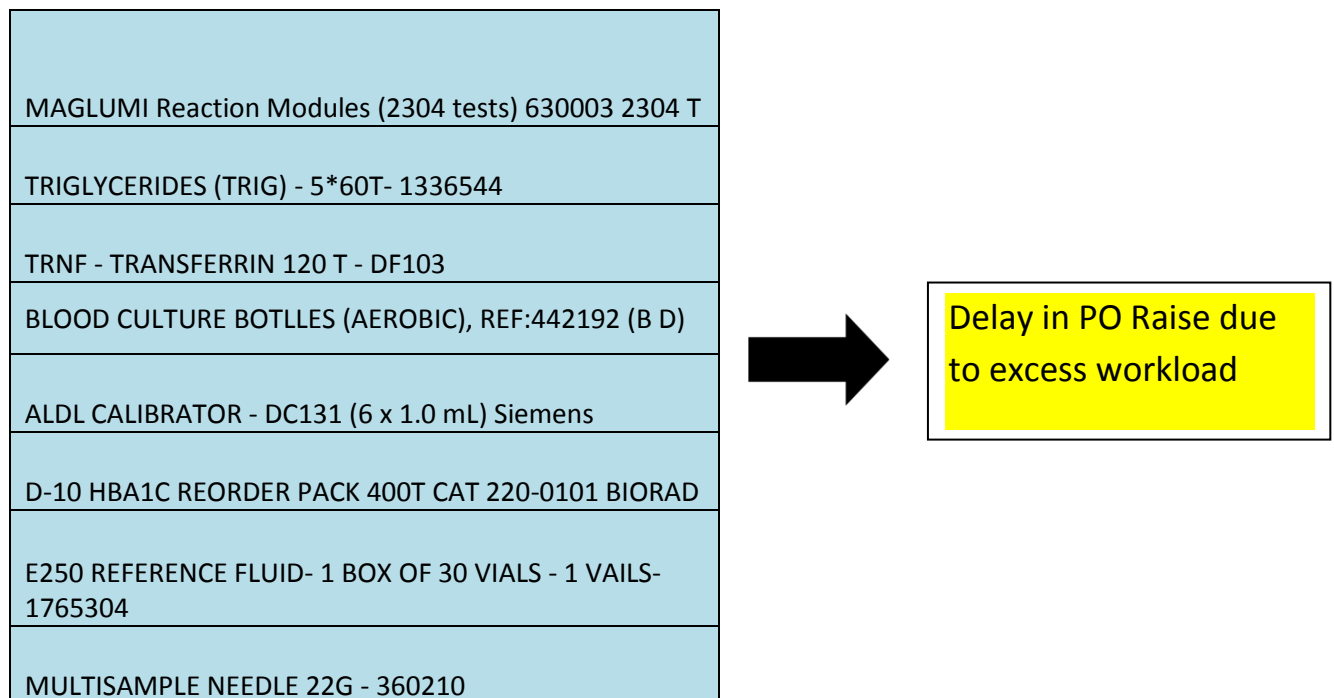
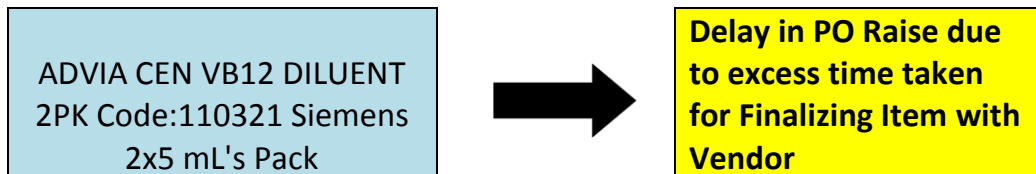
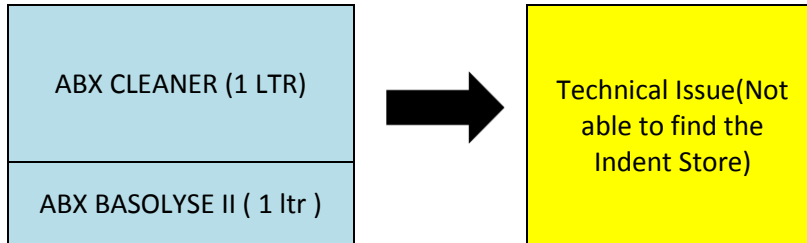
(Source- Data from Email communication)

Reasons for Delay in PO Raised TAT	Delay in Approval)	Technical Issue(Warehouse Indent)	Delay in PO Raise due to excess time taken for Finalizing Item with Vendor	Delay in PO Raise due to excess workload	Technical Issue(Not able to find the Indent Store)
TAT (In Days)	11	9	9	5	4
Item Count	11 Items	1 Item	1 Item	8 Items	2 Items

The respective items which are having PO Raised TAT more than 3 days are as follows:

Figure 5: shows items which are having PO Raised TAT more than 3 days





We had find out those Locations which are having PO Raised TAT more than 3 days both Location wise and Item wise.

Table 4: Locations with ITEM WISE high PO Raised TAT

Out of 24 Items	Location name
12	Mangalore Satellite Lab
5	Koramangala Regional Lab
2	Viman Nagar Regional Lab
2	Vijayawada Regional Lab
1	Kondapur Regional Lab
1	Indrapuram
1	Bowenpally Regional Lab

(Source- Data from Item wise TAT list)

Table 5: Locations with LOCATION WISE high PO Raised TAT

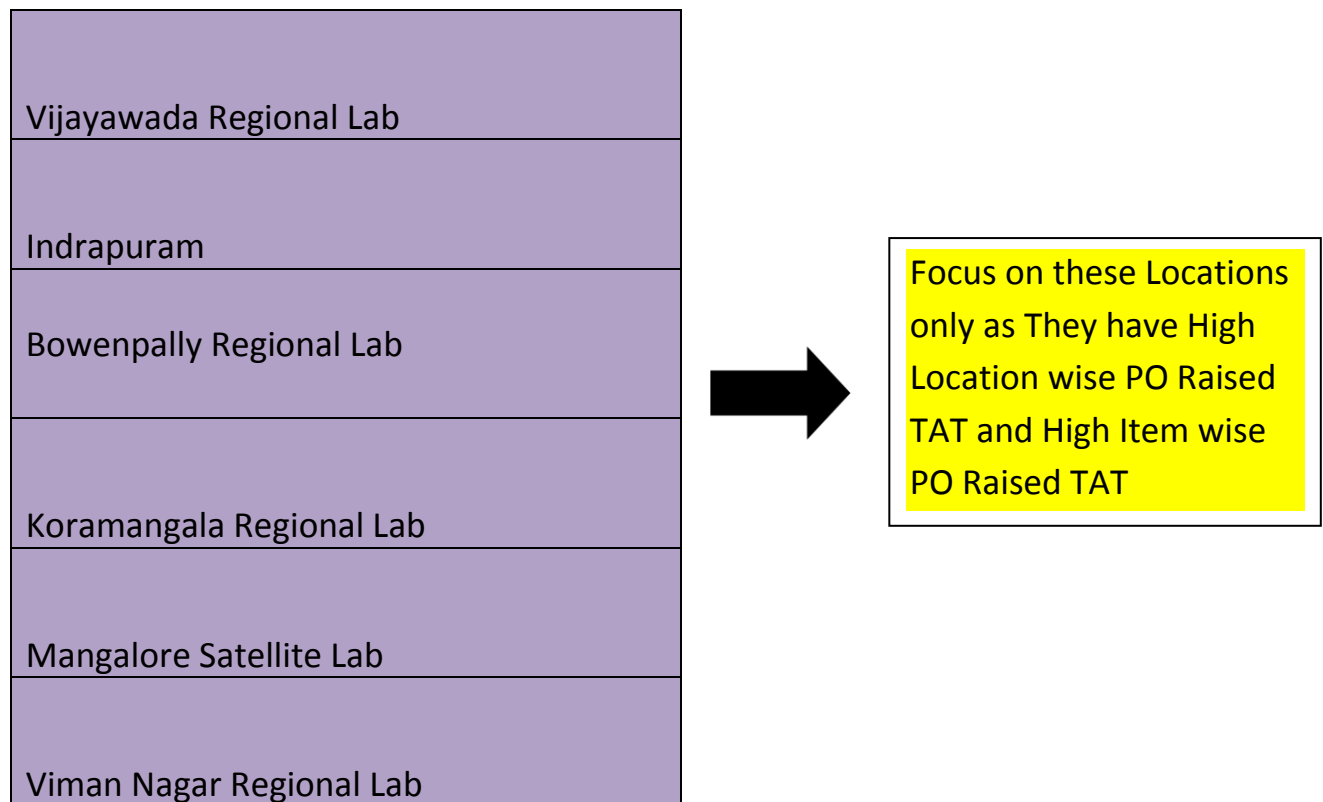
Bowenpally Regional Lab
Indrapuram
Koramangala Regional Lab
Mangalore Satellite Lab
Vijayawada Regional Lab
Viman Nagar Regional Lab
Vizag Satellite Lab
Warangal Satellite Lab

(Source- Data from location wise TAT list)

Out of these locations, We had taken only those common locations which are having Approval TAT more than 3 days both Location wise as well as Item wise to focus on exact reasons of delay in Approval TAT.

Those common locations are as follows:

Figure 6: shows Common locations which are having Approval TAT more than 3 days both Location wise as well as Item wise



Conclusion:

- Due to delay from Approver side, there is highest PO Raised TAT of 11 days. So, Indent should be approved on Time by the approver.
- Due to Technical Issue, there is PO Raised TAT of 9 days. So Avoid Technical Errors by following Correct Indenting Format by the respective locations.
- Due to delay in Raising PO by the Procurement Team due to excess time taken for Finalizing Item with Vendor, there is PO Raised TAT of 9 days. So Purchase Order should be raised by the Procurement Team on Time.
- Due to delay in Raising PO by the Procurement Team due to excess workload, there is PO Raised TAT of 5 days. So to avoid this, there should be Hiring of Additional Manpower and Equal Distribution of work.

A) DELAY IN DELIVERY TURN AROUND TIME (In days)

Methodology:

As per Standard Operative Procedures and guidelines of Apollo Diagnostics), The Standard Approval TAT was 15 days.

So to find out the Delay in Delivery TAT, We had taken data of all 345 items from item wise TAT list and out of those, we had selected those items, which were having Delivery TAT more than 15 days both in Item wise and Location wise,

(Source- SOPs of Lab store Department and Data from Insta Software)

So We observed that,

Out of 345 Items, 159 Items (46%) had Delivery TAT more than 15 days

Table 6: shows those 159 items, which were having Delivery TAT more than 15 days

ADVIA CENTAUR CP RGT 1 & 2 ,CODE : 497043 SIEMENS - 1000T
ADVIA CENTAUR PROBE TIPS Code:078-K139-01 Siemens 6480/BOX's Pack
ACS:CENTAUR SAMPLE CUPS Code:078-K137-01 Siemens 1500/BOX's Pack
PROGESTERON - (CENTAUR) , CODE 10310305
HA1C -GLYCATED HAEMOGLOBIN (INCLUDING CALIBRATORS) DF105A 120T (SIEMENS).
BILE ESCULIN AGAR ,REF NO: M340 (Himedia) 250 g
Mannitol Motility Test MediumM770-100G
Simmons Citrate Agar Slant SL034 - 10slants
TRIPLE SUGAR IRON AGAR ,REF NO: MM021 (Himedia) 250 g
UREASE AGAR BASE ,REF NO: M112 (Himedia) 250 g
GARBAGE COVER 30X 36 YELLOW WITHOUT PRINTING
ADVIA CEN ThCG DILUENT 2PK CODE:117143 2x25 ml' s Pack

MR/VP BROTH ,REF NO: LQ082 (Himedia) 250 g
GARBAGE COVER MED YELLOW (24x30)
FEM HAND WASH 5ltr
AcetoneMB179-500ML
Alberti's Stain AS001-125ML
AMPICILLIN (HIMEDIA) 5X50 Disc SD002
ANTIBIOTIC ZONE SCALE ,REF NO: PW-096 (Himedia) 1
ANTIBIOTIC ZONE SCALE -C ,REF NO: PW297 (Himedia) 1
Azithromycin SD204-1VL
Aztreonam SD212-1VL
Bacitracin SD003-1VL
Cefoperazone SD072-1VL

Cefoperazone/Sulbactam
Cefoxitin SD041-1VL
Ceftazidime SD062-1VL
Clindamycin SD051-1VL
COTRIMAXAZOLE ,REF NO: SD115 (Himedia) 1 Pack
DORIPENEM ,REF NO: SD283 (Himedia) 1 Pack
ERYTHROMYCIN (HIMEDIA) 5X50 Disc SD013
GENTAMICIN G ,REF NO: SD195 (Himedia) 1 Pack
Gram's IodineS013-125ML
Imipenem SD073-1VL
INDIAN INK ,REF NO: GRM5259 (Himedia) 23 mL
Kovacs' Indole ReagentR008-100ML

Levofloxacin SD216-1VL
Linezolid SD215-1VL
MEROPENEM (MRP) (HIMEDIA) 5X50 Disc SD727
NALIDIXIC ACID ,REF NO: SD021 (Himedia) 1 Pack
Nitrofurantoin SD023-1VL
Norfloxacin SD057-1VL
NOVABIOCIN ,REF NO: SD121 (Himedia) 1 Pack
Optochin (5 mcg)?(50 discs / vI)DD009-1VL
PENCILLIN G ,REF NO: SD028 (Himedia) 1 Pack
Peptone Water LQ089- 50X5ML
Piperacillin/Tazobactam SD210-1VL
POLYMYXIN B ,REF NO: SD029 (Himedia) 1 Pack

ANTI-D-IGG/IGM- RHEOFINAL-- 1 BOTTLE - 1X12ML - TULIP
COOMB'S ANTISERA-05 ML PACK - 1X5ML - TULIP
COVER GLASS SLIP (ASTRA SCIENTIFIC) 10PACKS (22X22)
ESTRADOIL - (CENTAUR) , CODE 10315326
MALCARD-ANTIGEN JAYAMITHRA 25T
RHELAX-RF (TULIP)25T
URINE PREGNANCY KIT - 50 T - PREGANEWS
CALIBRATOR "B" Code:00650577 Siemens 2/pk's Pack
FACE MASK
SYRINGES 2ML DISPOVAN - 1
ADVIA CENTAUR PROLACTIN Code:110758 Siemens 250's Pack
NORMAL SALINE 1 LIT

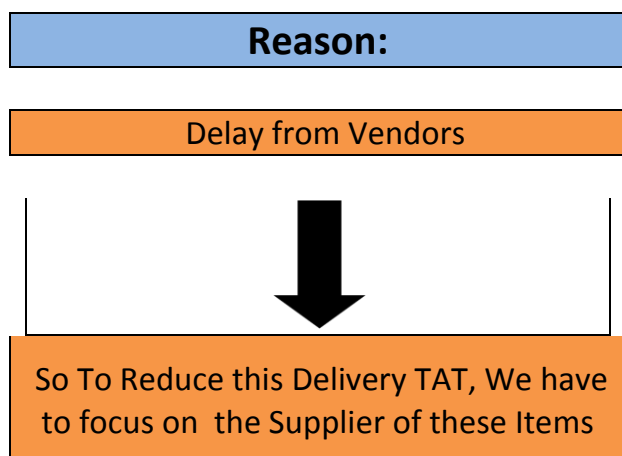
ADVIA CEN T3/T4/VB12 ANC RGT Code:110329 Siemens 6x25 mL's Pack
MULTISAMPLE NEEDLE 22G - 360210
ADVIA CENTAUR Total hCG Code:00644461 Siemens 250's Pack
ABX EOSINOFIX (1 LTR)
L2KAP2- AFP KIT,200 T , CODE:10381187 (IMMULITE 2K)
L2KCG2- HCG KIT,200 T , CODE:10381206 (IMMULITE 2K)
L2KCM2-CMV IGM KIT,200 T , CODE:10381320 (IMMULITE 2K)
L2KCVG2-IML. 2000 CMV IGG KIT , 200 T (IMMULITE 2K)
L2KRM2- RUBELLA IGM KIT,200 T , CODE:10381327 (IMMULITE 2K)
L2KRUB2- RUBELLA QUANT IGG KIT,200 T , CODE:10381338 (IMMULITE 2K)
L2KTXP2-IML. 2000 TOXO. QUANT. IGG KIT ,200 T , CODE:10381323 (IMMULITE 2K)
HAND CARE GLOVES-M

Safranin, 0.5% w/v S027-125ML
TEICOPLANIN ,REF NO: SD213 (Himedia) 1 Pack
TETRACYCLINE (HIMEDIA) 5X50 Disc SD037
TOBRAMYCIN ,REF NO: SD044 (Himedia) 1 Pack
VANCOMYCIN (HIMEDIA) 5X50 Disc SD045
CALIBRATOR "E" Code:04634452 Siemens 2/pk's Pack
SODIUM CHLORIDE 500GM
GLASS TEST TUBES (ASTRA SCIENTIFIC) 12X75 100'SPACK
Disposable Water Glass 250ML
REYNOLDS PEN 0.45
BARCODE LABEL STICKERS (2 "x 1") - 2000 Per Roll

ABX CLEANER (1 LTR)
ABX LYSEBIO (0.4LTR)
SODIUM HYPOCHLORITE 5% SOLUTION 5LTR
ABX DILUENT (20 ltrs)
ADVI CENTAUR FT4 250T- Code : 10282219
HCG SAMPLE DILUENT ; L2CGZ , CAT NO: 10387051, (1 x 25 ML)
MULTI DILUENT 2 ; L2M2Z4 , CAT NO: 10387058, (1 x 55 ML)
REACTION TUBES -1000 REACTIN TUBES, CAT NO:LRXT , (SIEMENS)
AST- ASPARTATE AMINOTRANSFERASE(GOT) 360T (SIEMENS) DF41A
Tissue Paper 100Sheet
ADVIA CEN MULTI DILUENT 11 2 X 5ML - 117228

ADVIA CENTAUR TSH Code:110734 Siemens 500's Pack
ADVIA CENTAUR VB12 Code:110748 Siemens 500's Pack
ABX BASOLYSE II (1 ltr)
CALIBRATOR 30 - 10379810
TROPONIN T 5 T ROCHE
ADIVA CENTAUR VITD 100 TEST Code:10699201 Pack:100s test
ADVIA CENTAUR T3 Code:110742 Siemens 400's Pack
ADVIA CENTAUR TESTOSTERONE Code:110782 Siemens 50's Pack
ADVIA CENTAUR FT3 Code:119780 Siemens 50's Pack
CALIBRATOR "Q" Code:118220 Siemens 2/pk's Pack

Figure 7 : shows the Reason for Delay in Delivery TAT is the Delay from Vendors



So, To find out the actual problem causing Vendors,

We have to find out those common Vendors whose Delivery TAT is high in maximum Locations as well as who are supplying higher number of items.

Table 7: Vendor Name(With High Location Wise Delivery TAT)	Count Of Locations
IRIS HEALTHCARE TECHNOLOGIES PVT LTD	11
Indian Hospitex Pvt Ltd.	5
BGLR - INDIAN HOSPITEX PRIVATE LTD	4
HORIBA INDIA PVT LTD	3
Vijay Stationary Mart	3
Artek Scientific (I) Corporation	2

CONTROL P TECHNOLOGIES	2
GLOBAL OFFICE AUTOMATION	2
Insight Diagnostics	2
S R Lab Products	2
SAFA DIAGNOSTICS	2
Tulasi Scientific Instruments	2
Beckman Coulter India Pvt Ltd.	1
BIO TEC	1
BIO-RAD LABORATORIES (I) PVT. LTD.	1
Colloq Marketing pvt ltd	1
GANESH SCIENTIFIC SUPPLIERS	1
Invitro Biosystems Pvt Ltd	1
LIFE-LINE ENTERPRISES	1
M/s. TECHFINE BIOMEDICALS,	1
Mariam Plastic Industries	1
NATIONAL SCIENTIFIC PRODUCTS	1
Origami Cellulo Pvt Ltd	1
ORTHO CLINICAL DIAGNOSTICS	1
Pragathi Enterprises	1
QUISQUALIS SCIENTIFICS	1
R ENTERPRISES	1
Raghava Bio-Medicals	1
Rohan Biochem	1
Sri Balaji General Trader	1
Trade Image	1

(Source- Data from location wise TAT list)

Table 8: Vendor Name((With High Item Wise Delivery TAT)	Count Of Items
IRIS HEALTHCARE TECHNOLOGIES PVT LTD	72
NATIONAL SCIENTIFIC PRODUCTS	19
Artek Scientific (I) Corporation	10
R ENTERPRISES	9
HORIBA INDIA PVT LTD	5
QUISQUALIS SCIENTIFICS	5
Beckman Coulter India Pvt Ltd.	4
Indian Hospitex Pvt Ltd.	4
Rohan Biochem	4
S R Lab Products	3
BGLR - INDIAN HOSPITEX PRIVATE LTD	2
GANESH SCIENTIFIC SUPPLIERS	2
GLOBAL OFFICE AUTOMATION	2
Pragathi Enterprises	2
SAFA DIAGNOSTICS	2
Tulasi Scientific Instruments	2
BIO TEC	1

BIO-RAD LABORATORIES (I) PVT. LTD.	1
CONTROL P TECHNOLOGIES	1
Indian Hospitex Private Limited.	1
Invitro Biosystems Pvt Ltd	1
LIFE-LINE ENTERPRISES	1
Mariam Plastic Industries	1
Origami Cellulo Pvt Ltd	1
Raghava Bio-Medicals	1
Sri Balaji General Trader	1
Trade Image	1
Vijay Stationary Mart	1

(Source- Data from Item wise TAT list)

Figure 8: shows those target common Vendors whose Delivery TAT was high in maximum Locations as well as who were supplying higher number of items

Vendor Name	Locations	Items
IRIS HEALTHCARE TECHNOLOGIES PVT LTD	11	74 items
Indian Hospitex Pvt Ltd.	5	5 items
HORIBA INDIA PVT LTD	3	5 items
Artek Scientific (I) Corporation	2	10 items



Focus on these Suppliers only as They have High Location wise Delivery TAT and High Item wise Delivery TAT

Conclusion:

As 159 items had Delivery TAT more than 15 days both in Item wise and Location wise,

So,

- Keep Buffer quantity of these items at User Level
Or Keep Stock of these items at warehouse level for emergency purpose
- Regular Follow Up with the Suppliers of these items
Or Search for Alternate Suppliers for these items.

Objective 2: To Optimize the Start up laboratory budget

For this, We had taken data from January month Start up kit budget of Old Lab (Mangalore Lab) and reduced that budget for New start up lab by following 4 means of Inventory Optimization

(Source- Data from Insta Software)

A) By removing extra items

B) By optimizing item wise consumption per test

C) By changing vendors with high items price

D) By negotiating with same vendors to decrease the item price

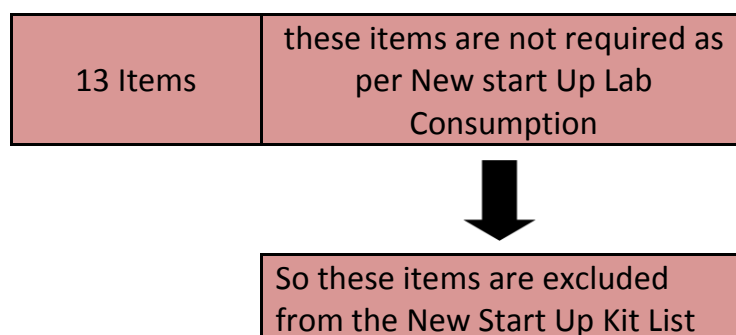
The findings are as follows:

A) By removing extra items

Table 9 : shows those extra items which are not required in New Start Up Lab

Item Name(which are Extra as per start up lab budget)	Quantity	Vendor Name
ABX MINICLEAN 1L ; Cat No(403010)	3	HORIBA INDIA PVT LTD
ABX MINIDIL 20 LTR ; Cat No(70005)	1	HORIBA INDIA PVT LTD
ABX MINOTROL 2X2ML ; Cat No(2042208)	2	HORIBA INDIA PVT LTD
ADVIA CENTAUR VIT.B12 DTT/REL AGENT (1X2X1) (121093)	1	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
ADVIA CENTAUR XP Acid/Base Reagent 1&2 Code:10310026 5000'test/Pack (2x1500ml)	1	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
BARIUM CHLORIDE 500ML	1	Tulasi Scientific Instruments
BLUE TIPS (ASTRA SCIENTIFIC) 500'SPACK	1	Tulasi Scientific Instruments
CALIBRATOR "C" Code:672172 Siemens 2/pk's Pack	5	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
GGT - 5*50T- 8257289	15	Southern marketing Agencies
PHOSPHOROUS (PHOS) - 5*60T- 1513209	5	Southern marketing Agencies
SURGICAL SPIRIT 5 LIT	10	Tulasi Scientific Instruments
URINE ANALYSIS CONTROL BIORAD 12X12ML (LEVEL I AND LEVEL 2)(CAT NO: 435)	1	BIO-RAD LABORATORIES (I) PVT. LTD.
VDRL (RECKON) 50'SPACK.	1	Tulasi Scientific Instruments

(Source- Data from Insta Software)



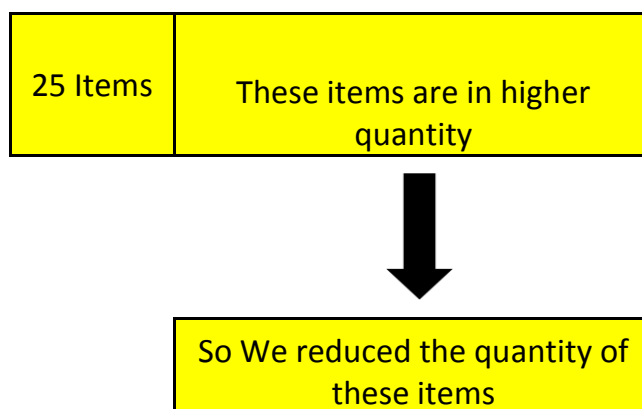
B) By optimizing item wise consumption per test

Table 10: shows those items (Which were excess in Quantity as per Start up lab budget

Item Name(Which were excess in Quantity as per Start up lab budget)	Quantity	Vendor Name
ALKALINE PHOSPHATASE (ALKP) - 5*60T- 1053180	5	Southern marketing Agencies
AST/GOT - 5*60T- 8433815	10	Southern marketing Agencies
BUBC - 5*60T- 8383051	5	Southern marketing Agencies
CALCIUM (CA) - 5*60T- 1450261	5	Southern marketing Agencies
CHLORIDE (CL) - 5*50T- 8445207	10	Southern marketing Agencies
CHOLESTROL (CHOL) - 5*60T- 1669829	5	Southern marketing Agencies
DISPOSABLE ESR PIPETTES	300	Tulasi Scientific Instruments
E250 REFERENCE FLUID- 1 BOX OF 30 VIALS - 1 VAILS- 1765304	3	Southern marketing Agencies
HCV(J.MITRA) 50'SPACK	3	Tulasi Scientific Instruments
HEMOSPOT KIT (CORAL)	3	Invitro Biosystems Pvt Ltd
MICRO SLIDES 50S	3	Tulasi Scientific Instruments
POTASSIUM (K+) - 5*50T- 8157596	5	Southern marketing Agencies
WIDAL (TULIP) 4X5ML	5	Tulasi Scientific Instruments
YELLOW TIPS (ASTRA SCIENTIFIC) 1000'SPACK	2	Tulasi Scientific Instruments

S.S. Spirit Lamp LA873-1NO	4	Tulasi Scientific Instruments
WIDAL (TULIP) 4X5ML	5	Tulasi Scientific Instruments
ABX MINOCLARE	3	HORIBA INDIA PVT LTD
ADVIA CEN T3/T4/VB12 ANC RGT Code:110329 Siemens 6x25 mL's Pack	2	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
ALBUMIN (ALB) - 5*50T- 8196057	5	Southern marketing Agencies
BLOOD UREA NITROGEN (BUN) - 5*60T- 8102204	5	Southern marketing Agencies
CALIBRATOR KIT 25-DHDL - 1SET- 6801896	2	Southern marketing Agencies
CALIBRATOR "A" Code:672170 Siemens 2/pk's Pack	3	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
CREATININE (CRSC) - 5*60T- 8141947	10	Southern marketing Agencies
GLUCOSE (GLU) - 5*60T- 1707801	15	Southern marketing Agencies
S.S. Spirit Lamp LA873-1NO	4	Tulasi Scientific Instruments

(Source- Data from Insta Software)



C) By changing vendors with high items price

Table 11: shows those items for those we had changed Vendors due to high price)

Item Name(for those we had changed Vendors due to high price)	Quantity	Supplier Name
ALKALINE PHOSPHATASE (ALKP) - 5*60T- 1053180	5	Southern marketing Agencies
AST/GOT - 5*60T- 8433815	10	Southern marketing Agencies
BLOOD GROUPING KIT (TULIP).	1	Invitro Biosystems Pvt Ltd
BUBC - 5*60T- 8383051	5	Southern marketing Agencies
CALCIUM (CA) - 5*60T- 1450261	5	Southern marketing Agencies
CALIBRATOR KIT 4- ALB,TP,BU,BC,TBIL,FE,TIBC - 1 SET- 1204668	1	Southern marketing Agencies
CHLORIDE (CL) - 5*50T- 8445207	10	Southern marketing Agencies
CHOLESTROL (CHOL) - 5*60T- 1669829	5	Southern marketing Agencies
COVER SLIPS (BLUE STAR) 1X20PACK 22MMX22MM	1	Invitro Biosystems Pvt Ltd
DENGUE DUO NS1& IGG& IGM (JAYMITHRA) 10T	1	Tulasi Scientific Instruments
DISPOSABLE ESR PIPETTES	300	Tulasi Scientific Instruments
Double Distilled Water 5ltr	3	Tulasi Scientific Instruments

E250 REFERENCE FLUID- 1 BOX OF 30 VIALS - 1 VAILS- 1765304	3	Southern marketing Agencies
HCV(J.MITRA) 50'SPACK	3	Tulasi Scientific Instruments
HEMOSPOT KIT (CORAL)	3	Invitro Biosystems Pvt Ltd
LEISHMANIA STAIN- 500ML.	1	Tulasi Scientific Instruments
MICRO SLIDES 50S	3	Tulasi Scientific Instruments
MULTISTIX SG 100 STRIPS, Siemens	2	Tulasi Scientific Instruments
POTASSIUM (K+) - 5*50T- 8157596	5	Southern marketing Agencies
RETICULOCYTE DILUTING FLUID “ 100 ML .	1	Tulasi Scientific Instruments
Rhelax RF (Tulip) 25 T	1	Tulasi Scientific Instruments
WIDAL (TULIP) 4X5ML	5	Tulasi Scientific Instruments
YELLOW TIPS (ASTRA SCIENTIFIC) 1000'SPACK	2	Tulasi Scientific Instruments

(Source- Data from Insta Software)

23 Items	These Item's price is higher
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So We changed the Vendors for
these Items and selected the
Vendors with the low items price

D) By negotiating with same vendors to decrease the item price

Table 12: shows those items for those we negotiated with Vendors for decreasing item price)

Item Name(For those we negotiated with Vendors for decreasing item price)	Quantity	Supplier Name
7% BSA SOLUTION - 12 * 5 ML- 8262487	1	Southern marketing Agencies
ABX MINOCAL 1X2ML ; Cat No(2032002)	1	HORIBA INDIA PVT LTD
ABX MINOCLARE	3	HORIBA INDIA PVT LTD
ACS:CENTAUR CUVETTES Code:078-K138-01 Siemens 3000/BOX's Pack	1	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
ADVIA CEN MULTI -DILUENT 1 6PK Code:110313 Siemens 6x25 mL's Pack	1	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
ADVIA CEN T3/T4/VB12 ANC RGT Code:110329 Siemens 6x25 mL's Pack	2	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
ALBUMIN (ALB) - 5*50T- 8196057	5	Southern marketing Agencies
AVITEX ASO 25 TESTS OD153/A OMEGA 90153AV2	1	Tulasi Scientific Instruments
BLOOD UREA NITROGEN (BUN) - 5*60T- 8102204	5	Southern marketing Agencies
CALIBRATOR KIT 25-DHDL - 1SET- 6801896	2	Southern marketing Agencies
CALIBRATOR "A" Code:672170 Siemens 2/pk's Pack	3	IRIS HEALTHCARE TECHNOLOGIES PVT LTD
Ceder wood Oil	1	Tulasi Scientific Instruments
CREATININE (CRSC) - 5*60T- 8141947	10	Southern marketing Agencies

CRP 25T SPAN OMEGA-90143AV2	1	Tulasi Scientific Instruments
GLASS TEST TUBES (ASTRA SCIENTIFIC) 12X75 100'SPACK	3	Tulasi Scientific Instruments
GLUCOSE (GLU) - 5*60T-1707801	15	Southern marketing Agencies
MICRO TIPS - 1 BOX OF 250 TIPS- 1474030	1	Southern marketing Agencies
Neubaur counting Chamber	1	Tulasi Scientific Instruments
S.S. Spirit Lamp LA873-1NO	4	Tulasi Scientific Instruments
VERSA TIP BOX - 1000 TIPS-6801715	1	Southern marketing Agencies

(Source- Data from Insta Software)

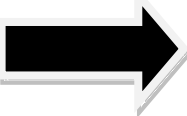
20 Items	These Item's price is higher
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So We negotiated with these item's Vendors to decrease the price

RESULT:

We have **reduced** that Start up kit budget from Rs. 4, 36,271/- to Rs. 2, 73,436/-

Old Lab Start up kit budget		New Lab Start up kit budget
Rs. 4, 36,271/-		Rs. 2, 73,436/-

Objective 3: To analyze stock movements in the store and to classify the items on the basis of their consumption value and movement

To find out this, We had taken data of all 965 items of last 5 months (November, December, January, February and March) and done analysis by following 3 means of inventory categorization methods.

- A) ABC Analysis
- B) FSN Analysis
- C) ABC- FSN Matrix

A) ABC ANALYSIS:

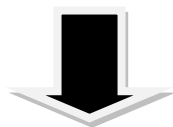
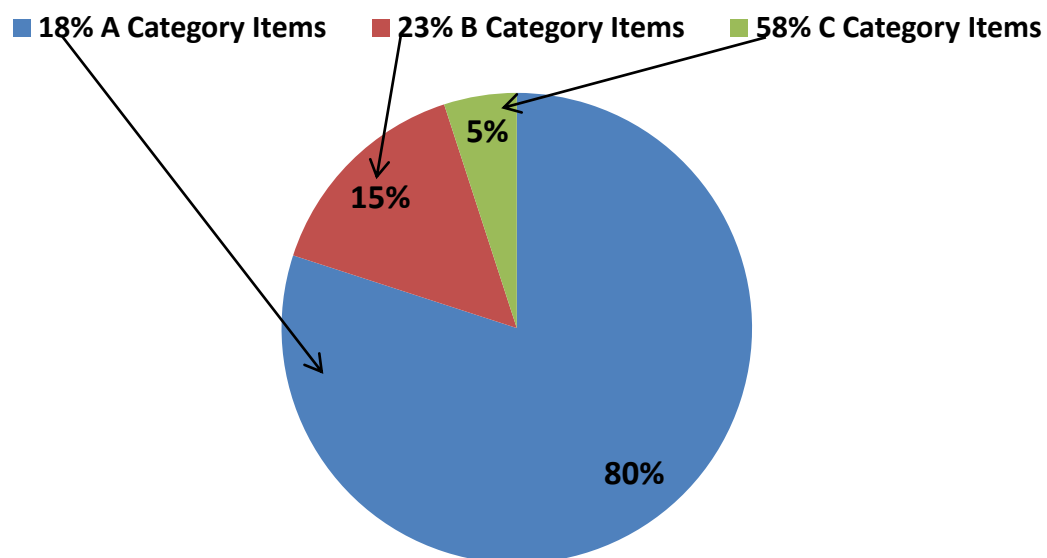
ABC analysis is an inventory categorization method which consists in dividing items into three categories, according to their rate of consumption that is A, B and C: A being the most valuable items, C being the least valuable ones.

- **A-items** are items which **annual consumption value is the highest**. The top 70-80% of the annual consumption value of the company typically accounts for only 10-20% of total inventory items in general.
- **B-items** are the interclass items, with a **medium consumption value**. Those 15-25% of annual consumption value typically accounts for 30% of total inventory items in general.
- **C-items** are, on the contrary, items with the **lowest consumption value**. The lower 5% of the annual consumption value typically accounts for 50% of total inventory items in general.

So after ABC Analysis of all 965 items, The findings are as follows:

	ABC ANALYSIS	
178 items	A category	18%
226 items	B category	23%
561 items	C category	58%

Figure 9- ABC ANALYSIS



18% A category items contributed 80% of the total cost	23% B category items contributed 15% of the total cost	58% A category items contributed 5% of the total cost
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(Source- Data from Insta Software)

Conclusion :

A-items:

- **A-items** should have **tight inventory control**.
- It should have **more secured storage areas** and **better sales forecasts**.
- Reorders should be **frequent**, with weekly or even daily reorder. **Avoiding stock-outs** on A-items is a priority.

B-items:

- **B-items** benefit from an intermediate status between A and C. An important aspect of class B is the **monitoring** of potential evolution toward class A or, in the contrary, toward the class C

C-items:

- Reordering **C-items** is made less frequently. A typically inventory policy for C - items consist of having only 1 unit on hand, and of reordering **only when an actual purchase is made**.
- This approach leads to stock-out situation after each purchase which can be **an acceptable situation**, as the C-items present both low demand and higher risk of **excessive inventory costs**.

B) FSN ANALYSIS:

In **FSN analysis**, items are classified according to their rate of consumption. The items are classified broadly into three groups:

F – Fast moving

S – Slow moving

N – Non-moving

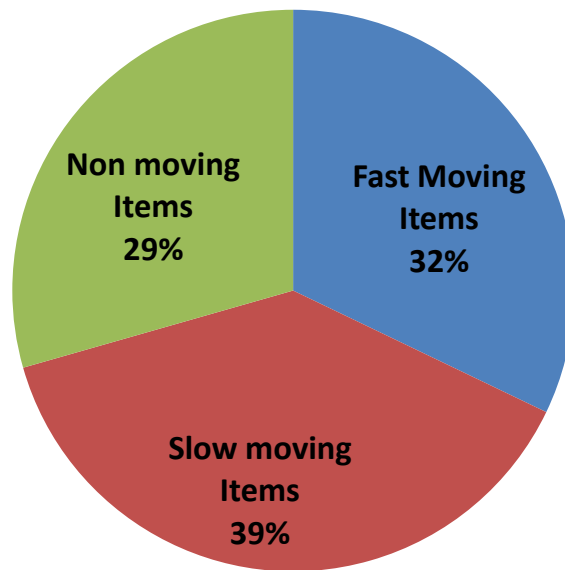
Classification is based on the pattern of Issues from stores and is useful in controlling obsolescence. It helps to avoid investments in Non Moving and Slow moving Items. It is also useful in facilitating timely control

So after FSN Analysis of all 965 items, The findings are as follows:

	FSN ANALYSIS	
310 Items	Fast Moving Items	32%
371 Items	Slow moving Items	38%
284 Items	Non moving Items	29%

(Source- Data from Insta Software)

Figure 10 -FSN ANALYSIS



Conclusion:

Fast moving Items:

The items to be considered to be “active” may be reviewed regularly on more frequent basis

Slow moving Items:

The items to be considered to be “less active” may be reviewed once in two- three months.

Non moving Items:

Non-moving items whose consumption is “nil” or almost in significant. So avoid investment in Non Moving Items

C) ABC- FSN Matrix:

Coupling of ABC and FSN analysis is an efficient and effective tool to classify the Inventory Items. The matrix retrieved from the combination of these two classification methods can ease up the inventory management by narrowing down number of items that need special attention and high level management.

So after Coupling of ABC and FSN analyses of all 965 items, The findings are as follows:

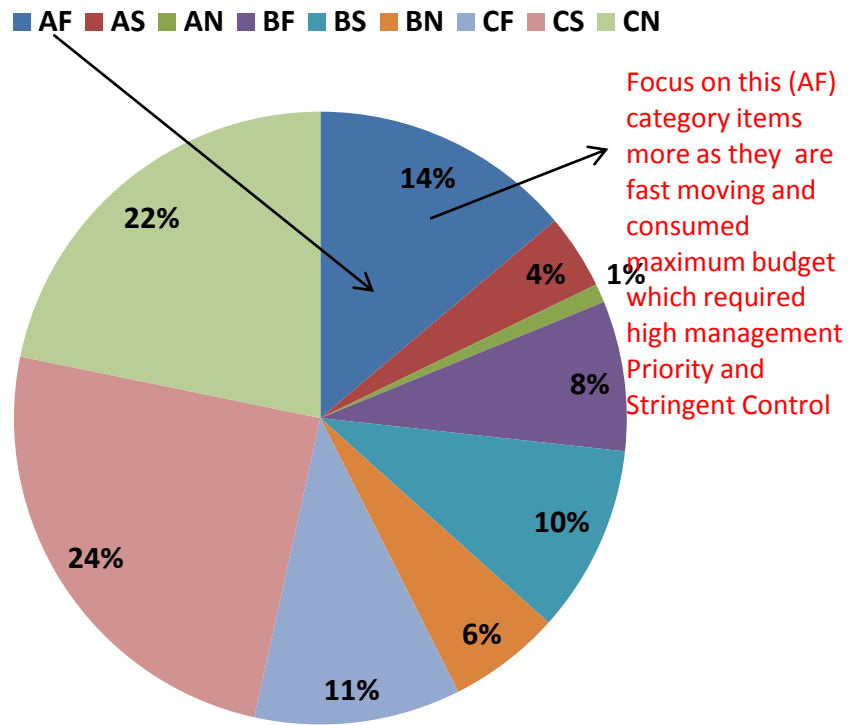
ABC-FSN MATRIX

	Fast Moving	slow moving	Non moving
A category	131(AF)	36(AS)	12(AN)
B category	75(BF)	95(BS)	57(BN)
C category	104(CF)	240(CS)	217(CN)

	Fast Moving	slow moving	Non moving
A category	14%(AF)	4%(AS)	1%(AN)
B category	8%(BF)	10%(BS)	6%(BN)
C category	11%(CF)	25%(CS)	22%(CN)

(Source- Data from Insta Software)

Figure 11: ABC- FSN MATRIX



(Source- Data from Insta Software)

Those (AF) Category items which require High Management Priority, Stringent Control and Regular Follow up are as follows:

Table 13: Those (AF) Category items which require High Management Priority, Stringent Control and Regular Follow up

ADVIA CENTAUR FT3 Code:119780 Siemens 50's Pack	TOTAL BILIRUBIN (TBIL) - 5*60T- 8159931	CREA-CREATININE 480T (SIEMENS) DF33A
HAND CARE GLOVES - 100.S(NON-STE)	DENGUE DUO NS1&IgG&IgM (SD) 10T	ABX LYSEBIO 1 LTR ; Cat No(906012)
SODIUM (NA) - 5*50T- 8379034	ADVIA CENTAUR VIT.B12 DTT/REL AGENT (1X2X1) (121093)	URCA-URIC ACID 480T (SIEMENS) DF77
POTASSIUM (K+) - 5*50T- 8157596	ALKALINE PHOSPHATASE (ALKP) - 5*60T- 1053180	TBI- TOTAL BILIRUBIN 480T (SIEMENS) DF167
GLUCOSE (GLU) - 5*60T- 1707801	URINERY DRUG TEST 5 PANEL (AMP,COC,MOR,PCP,THC) 25T.	THERMAL PRINTER PAPER FOR XPAND/ARX/XL/RXL/MAX (4 ROLLS 97MTR EACH) (SIEMENS) D829
ACT 5 DIFF DILUENT 20LTR 8547169	HBSAG ES 100'S PACK CODE:6802131	BARCODE LABEL STICKERS (2 "x 1") - 2000 Per Roll
PHOSPHOROUS (PHOS) - 5*60T- 1513209	MICRO TIPS 200-1000 1/2" 1/2" 1/2" BIG (500'SPACK).	PHOS-PHOSPHORUS 480T (SIEMENS) DF61.
HCV TRIDOT 100T	ABX PENTRA - 60C+ CONTROLS HIGH	ACT 5 DIFF FIX 1 LTR 8547171
PAN MALARIA CARD 25 TEST-J.MITRA	ABX PENTRA - 60C+ CONTROLS LOW	EXAMINATION GLOVES (M)
STERILE COTTON SWAB, [PKT / 100], CAT.PW003, HM	URINE CONTAINER 30ML (STERILE) 100'SPACK	ABX MINICLEAN 1L ; Cat No(403010)
TRIGLYCERIDES (TRIG) - 5*60T- 1336544	CALIBRATOR "Q" Code:118220 Siemens 2/pk's Pack	BAND AID REGULAR (HANSA PLAST)
ALCOHOL SWAB	ADVIA CENTAUR Total hCG Code:00644461 Siemens 250's Pack	CALIBRATOR "E" Code:04634452 Siemens 2/pk's Pack
ADVIA CEN T3/T4/VB12 ANC RGT Code:110329 Siemens 6x25 mL's Pack	VACUTAINER SODIUM CITRATE CAT.363083 BD 3.2%	DIASTIX SIEMENS 50STRIPS 2804B

URINE CONTAINER-50ML(NON-STERILE)	CALIBRATOR "A" Code:672170 Siemens 2/pk's Pack	ADVI CENTAUR FT4 250T- Code : 10282219
Snap Pack 03112349. Make : Roche	ADVIA CENTAUR CLEANING SOLUTION Code:112748 Siemens 12/BOX's Pack	CREATININE (CRSC) - 5*60T- 8141947
Apollo Diag Envelops with window (Die cut for Window)-11.43 (H) x 25 as per approved design&sample.	DISTILLED WATER 20LTRS	ALP-ALKALINE PHOSPHATE 360T (SIEMENS) DF15A
BUN-UREA NITROGEN 480T (SIEMENS) DF21	BAND AID[WASHPROOF]	ADVIA CENTAUR TESTOSTERONE Code:110782 Siemens 50's Pack
ALT-ALANINE AMINOTRANSFERASE (GPT) 240T(SIEMENS) DF143	PARAFILIM 4 INCHES 250 FEET	ABX MINOTROL 2X2ML ; Cat No(2042202)
BD 2ml Syringe With Needle	BD 5ml Syringe With Needle	ABS DIMENSION ABSORBANCE 240 T- DF179
SIGNAL REAGENT CODE:1072693	AST- ASPARTATE AMINOTRANSFERASE(GOT) 360T (SIEMENS) DF41A	ADVIA CENTAUR THCG US 250T- Code : 10308985
MAGLUMI Starter Kit 1+2 (3 pairs=6 vials) 130299004M 690ml	ADVIA CENTAUR FERRITIN Code:110745 Siemens 50's Pack	VDRL (RAPID) 40'SPACK.
White, Teal Blue & Rose Berry Shade, 3/4th Hand Lenth Technician Apron Coat As per approved sample.	CALIBRATOR "B" Code:00650577 Siemens 2/pk's Pack	TP- TOTAL PROTEIN 480T (SIEMENS) DF73

D-10 HBA1C REORDER PACK 400T CAT 220-0101 BIORAD	ADVIA CENTAUR PSA Code:118156 Siemens 100's Pack	Snappack For Electrolyte Analyser Model No: 9180
AHDL (REVISED) NON- PRETREATMENT HDL (SIEMENS) 240T DF48B	ADVIA CENTAUR T4 Code:110736 Siemens 500's Pack	TGL-TRIGLYCERIDES 480T (SIEMENS) DF69A
Combur 10M test 100Strips Make:ROCHE	Multisample Needle 22g 367210 B.D	DBI- DIRECT BILIRUBIN 320T (SIEMENS) DF125
CUVETTE CATRIDGES D828 (12000 CUVETTES).	ADVIA CENTAUR T3 Code:110742 Siemens 400's	ANTI HCV 100'S PACK CODE: 1318450

	Pack	
ADIVA CENTAUR VITD 100 TEST Code:10699201 Pack:100s test	GLU-GLUCOSE 1440T (SIEMENS) DF40	ACS:CENTAUR CUVETTES Code:078-K138-01 Siemens 3000/BOX's Pack
ADIVA CENTAUR XP WASH 1Code:03773025 Pack:2x2500ml	URINE CONTAINER- 50ML(STERILE)	VACUTAINER SODIUM FLUORIDE-367587 (100'SPACK).
MULTISTIX SG 100 STRIPS, Siemens	ADIVA CENTAUR VB12 Code:110748 Siemens 500's Pack	DIRECT HDL - 5*60T- 6801895
White Paper A4 500Sheet	CHOL-CHOLESTEROL 480T (SIEMENS) DF27	ACT 5 DIFF WBC LYSE 1 LTR 8547170
ANTI HIV 1+2 REAGENT 100'S PACK CODE:1241850	DENGUE DUO NS1& IGG& IGM (JAYMITHRA) 10T	ADIVA CENTAUR PROLACTIN Code:110758 Siemens 250's Pack
ADIVA CENTAUR TSH Code:110734 Siemens 500's Pack	VACUTAINER PLAIN RED 4ML, 13X75MM CAT NO 367812 BD Box = 100	HA1C -GLYCATED HAEMOGLOBIN (INCLUDING CALIBRATORS) DF105A 120T (SIEMENS).
VACUTAINER EDTA (B.D) 100'SPACK 367856	PAP SMEAR KIT	MAINTENANCE PACK CODE:1831312

BLOOD UREA NITROGEN (BUN) - 5*60T- 8102204	LATEX EXAMINATION GLOVES NO POWDER PIONEER (Medium) 6.5 Size
CHLORIDE (CL) - 5*50T- 8445207	6 Drug Pannel KIT[Amphetamine+Barbiturates+Benzodiazapines+Opiates+cocaine+Tetrahydr oCannabinol]
URIC ACID (URIC) - 5*60T- 1943927	BUBC - 5*60T- 8383051
Home Collection Bag Small (18x12x8 cm)	CA-CALCIUM 480T (SIEMENS) DF23A
AST/GOT - 5*60T- 8433815	GGT - 5*50T- 8257289
STERILLIUM 500 ml	MAGLUMI TSH 130203001M 100T
APOLLO DIAGNOSTICS A4 SIZE REPORT PAPER	CRP LATEX(EURO) 25T
CALCIUM (CA) - 5*60T- 1450261	ANTI-HIV 1/2 CONTROL CODE: 6800586

Immunoassay Plus Trilevel Controls 12x5ml Cat no:370	TEST REQUISITION FORMS , A4 SIZE, SINGLE COLOUR PRINT AS PER APPROVED DESIGN.
00024330009/GEM 3K/ISE/GL 300 TEST CARTRIDGE	THERMAL PAPER ROLL 110MM
ABX MINIDIL 20 LTR ; Cat No(70005)	ADVIA CENTAUR XP Acid/Base Reagent 1&2 Code:10310026 5000'test/Pack (2x1500ml)
BIOCHEMISTRY ASSAYED CONTROL (LYPOCHEK) LEVEL-1 12X5 ML CAT. C- 310-5 BIORAD	Double Distilled Water 5ltr
BIOCHEMISTRY ASSAYED CONTROL (LYPOCHEK) LEVEL-2 12X5 ML, CAT. C- 315 BIO-RAD	ABX MINOCLARE
ADVIA CENTAUR FSH Code:110755 Siemens 100's Pack	HBSAG 25T [VIRUCHECK] ,ORCHID/TULIP CAT.30201025
Biovue A.B.C.D TL RevDil 400 Cat No:707100 Pack Size:20Cassettes	GGT-GAMMA GLUTAMYL TRANSFERASE 288T (SIEMENS) DF45A
ADVIA CENTAUR LH Code:110753 Siemens 60's Pack	MALB- MICROALBUMIN 80T (SIEMENS) DF114.

Those (AN) Category 12 items which were Maximum budget consuming and Non moving are as follows:

Figure 12: shows those (AN) Category 12 items which were Maximum budget consuming and Non moving

MAGNESIUM (MG) - 5*60T- 8255093
JAT-TRANSFUSION MEDICINE, AUTOMATED (BD-CAP PT-15)
K-LIGAND ASSAY, GENERAL (BD-CAP PT-15)
UDS-URINE DRUG SCREENING (BD-CAP PT-15)
C3-CHEMISTRY (BD-CAP PT-15)
GH5I-HEAMOGLBIN A1C, 5 CHALLENGES (BD-CAP PT-15)
VM1-VIRAL MARKERS (BD-CAP PT-15)
Y-LIGAND ASSAY, SPECIAL (BD-CAP PT-15)
FL1-FLOW CYTOMETRY (BD-CAP PT-15)
MAGLUMI 25 OH-VITAMIN D CAT NO 130211004M 100 T
FH10-HEMATOLOGY AUTOMATED DIFFRENTIAL COUNT (BD-CAP PT-15)



**AN category items
should be in nil stocks as
they were Maximum
budget consuming and
Non moving**

Suggestions:

	Fast Moving Items	Slow moving Items	Non Moving Items
A category Items	(AF) Constant Control and Regular Follow up	(AS)items should be in Moderate Stocks	(AN) items should be in Nil Stocks
B category Items	(BF) items should be in Moderate Stocks	(BS)items should be in Moderate Stocks	(BN) items should be in Very Low Stocks
C category Items	(CF) items should be in High Stocks	(CF) items should be in Moderate Stocks	(CN) should be in Low Stocks

RESULT:

Out of 345 items, 159 items had delay in Delivery TAT 57 items had delay in Approval TAT and 24 items had delay in PO Raised TAT. Delay from the vendors was the highest reason for delay in Delivery TAT, Inadequacy of Required Data and High Indenting Quantity as per Monthly Average Consumption were the highest reason for delay in Approval TAT. Delay in Approval and Technical Issue were the highest reason for delay in PO Raised TAT. The significant reduction in start up laboratory budget by removing extra items, By optimizing item wise consumption per test By changing vendors with high items price and By negotiating with same vendors to decrease the item price and Inventory control had done by analysis by following 3 means of inventory categorization methods, (i) ABC Analysis, (ii) FSN Analysis, (iii)ABC- FSN Matrix

CONCLUSIONS

keeping buffer quantity of the critical items at User Level or at warehouse level for emergency purpose and regular follow up with the Suppliers of items can be reduced Delivery TAT. Indent should be raised with adequate data and should be raised in accordance with Monthly Average Consumption from the respective locations to reduce Approval TAT. Indent should be approved within time by the approver and technical Errors by following Correct Indenting Format by the respective locations to reduce PO Raised TAT. Stringent Control and Regular Follow up should be done for (AF) category items as are fast moving and consumed maximum budget and (AN) category items should be in Nil Stocks as they consumed maximum budget and non moving

REFERENCES:

- Salter J., Cox J., Turek M., Calus T., Cookson O., Moffatt F., Turner P., Parkhill J., Loman J., Walker W., (2014) “Reagent and laboratory contamination can critically impact sequence-based microbiome analyses”, BMC Biology, 2014; 12: 87.
<http://biorxiv.org/content/early/2014/07/16/007187>
- Hasselback L., Crawford J., Chaluco T., Rajagopal S., Prosser W., Watson N., (2014). “Rapid diagnostic test supply chain and consumption study in Cabo Delgado, Mozambique: estimating stock shortages and identifying drivers of stock-outs”, Journal List, Malar J. 2014; 13: 295.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4237853/>
- Boneno J., Fokakis M., Armbruster D., (2005). “ Reagent Carryover Studies: Preventing Analytical Error with Open Clinical Chemistry Systems”
Lab Med. 2005; 36(11):705-710
http://www.medscape.com/viewarticle/515754_4