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Namratha Oil Refineries Pvt. Ltd.: Tackling Oil GiveAway

Amol S. Dhaigude, Vasanth Kamath VP, and Arun P. Sasi wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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On the cold and breezy evening of March 15, 2017, Madhav Kumar, director of the plant (operations), Namratha Oil Refineries Pvt. Ltd. (NORPL), was restlessly studying the company’s annual process loss reports. The significant process losses in the form of oil giveaway[[1]](#footnote-1) were a cause of worry and had cost him his sleep. The fluctuating cost of pure coconut oil, compounded with the process losses, had significantly weakened the company’s bottom line. Kumar had, therefore, been assigned to devise an appropriate strategy to address the oil giveaway problem. Kumar had just held a meeting with his subordinates to come up with a solution but was not satisfied with the outcome of the discussion. He was scheduled to present his strategy to the board the next morning at 10 a.m. and had less than 16 hours to come up with a suitable plan.

NAMRATHA OIL REFINERIES PVT. LTD. (NORPL): COMPANY HISTORY

NORPL was one of the leading firms in the Indian state of Karnataka involved in the manufacture and packaging of pure coconut oil products. The company was founded in 1995, in Tiptur,[[2]](#footnote-2) India, by three brothers—B. S. Arun Kumar, B. S. Shiva Prasad, and B. S. Ravindra—who foresaw a market for pure packaged coconut oil in the state and decided to tap into it. Over the years, the company achieved significant growth due to the uncompromised quality and the purity and freshness of their products. NORPL sourced the best quality *copra*[[3]](#footnote-3) from local farmers at a competitive price. The company followed a typical family-run business structure, resembling a flat structure (see Exhibit 1).

Customer satisfaction, one of NORPL’s core values, had held the company in good stead in the long run. All products manufactured by the company were organic in nature, without any preservatives or chemicals, and were known for their unique aroma, colour, and taste. The company achieved quality standards and shelf life by ensuring that its manufacturing processes met all the mandatory quality parameters. The products were available in three types of stock keeping units (SKUs): pouches, wide-mouth jars, and narrow-mouth bottles in various volume specifications.

NORPL had only one plant in Tiptur, Karnataka, which had the capacity to manufacture and package 250 tonnes[[4]](#footnote-4) of coconut oil. The manufacturing operations required a high level of skills and knowledge to precisely maintain the product quality. The packaging operations did not require as much expertise as manufacturing, and accordingly, the company employed skilled employees in the manufacturing division and semi-skilled and unskilled employees in the packaging division. NORPL had been very successful in its operations, witnessing a steady rise in revenue over the past 22 years (see Exhibit 2, 3A, and 3B). It also had received several awards from various government bodies and non-governmental organizations for its unrelenting delivery of quality products.

the coconut oil MANUFACTURING PROCESS[[5]](#footnote-5)

Copra, the raw material used for manufacturing coconut oil, consisted of 70 per cent coconut oil and 30 per cent copra cake by weight. Copras were dried coconut kernels made by plucking and de-husking mature coconuts and drying the nuts using sunlight or other heating methods. The copra cups were then tested for quality compliance, after which they were unloaded in batches into silos. The oil extraction process involved four operations: cutting, cooking, expelling, and filtration (see Exhibit 4). The copra cups were cut into small pieces in a hammer milling machine and then transferred to a cooker and heated to a temperature of about 80 degrees Celsius (176 degrees Fahrenheit). The cooking operation increased the yield by breaking down the protein fibres in the copra and reducing the moisture content.

The cooked copra pieces were then passed through expellers for oil extraction. The expelling operation involved two stages. In the first stage, almost 58 per cent of coconut oil in the copra was extracted, and the first-stage copra cake was produced. This cake, which had approximately 50 per cent coconut oil by weight, was then passed through a second-stage expeller, which further extracted 45 per cent of the remaining coconut oil, thereby leaving nine per cent of coconut oil by weight in the final cake. The final cake was generally used for manufacturing cattle feed, biscuits, and other products. The last step of the oil production process was filtration, in which the oil underwent a double-stage filtration process. The primary filtration used a Vibro sieve[[6]](#footnote-6) that filtered the coconut oil by removing small copra particles. The secondary filtration occurred in a filter press that filtered fine copra particles from the coconut oil and rendered it to the required quality. The manufacturing division operated for 24 hours a day for 25 days a month.

The coconut oil was then stored in farm tanks having a capacity varying from 40–300 tonnes. After a set of rigorous quality checks, the coconut oil was dispatched to the filling units for filling and packaging.

PRODUCT FILLING AND PACKAGING

The filling unit consisted of three lines that filled the oil in pouches, wide-mouth jars, and narrow-mouth bottles (see Exhibit 5). The coconut oil stored in farm tanks was transferred to four 15-tonne capacity day-tanks using centrifugal pumps. The oil in the four day-tanks was transferred to the filling machines of individual lines through dedicated oil lines. An intermediate oil storage tank, also known as the buffer tank, acted as a regulator between the day-tanks and the filling machine so that level differences in the day-tanks did not affect the functioning of the filling machines. The filling operations in the filling machines were based on the principle of volumetric filling, a process by which the quantity of product (usually liquids and semi-solids) was measured and filled using a predetermined volume of reciprocating pistons and cylinders.

The pouch line consisted of a single nozzle pouch machine. The laminate, which formed the primary package of pouches, was loaded in the pouch machine. The vertical and horizontal sealers sealed the laminate, and the filling machine filled the oil in the pouches from a nozzle. The filling nozzle was connected to a filling cylinder, and the filling operation took place according to the movement of the piston inside the filling machine. After this operation, the pouches were packed into cartons and stored in the finished goods storage area.

The wide-mouth line consisted of an eight-headed linear filling machine.[[7]](#footnote-7) The empty wide-mouth jars were fed into the filling machine for filling. The jars were filled, then sealed and capped using a sealing machine and a capping machine, and then packed into cartons and stored in the finished goods storage area.

The packaging operations of narrow-mouth bottles were similar to the packaging for wide-mouth jars except that the narrow-mouth bottles were capped after the filling operation, and no sealing process was involved.

The packaging division operated for 16 hours a day for 25 days a month. The average monthly demand for SKUs included 340,000 pouches, 120,000 wide-mouth jars, and 280,000 narrow-mouth bottles. The finished goods in the finished goods storage were checked for quality compliance and then dispatched to depots based on the plan generated by the advanced planner and optimizer software.

THE OIL GIVEAWAY ISSUE

Operators were assigned to the three filling lines, based on the line speed. The pouch line was the slowest with a speed of 21 pouches per minute, followed by the wide-mouth line with a speed of 35 jars per minute, and the narrow-mouth line with a speed of 40 bottles per minute. Three operators were assigned to the pouch line and five operators each to the wide-mouth line and the narrow-mouth line. The various tasks associated with the lines are shown in Exhibit 6.

The quantity of oil filled in each line was expressed in kilolitres[[8]](#footnote-8) (KL), and it varied each month for each line based on the filling plan shared by the marketing and sales team. The filling plan of each line for the past year is shown in Exhibit 7.The issue of an oil giveaway was observed in the filling operation. *Oil giveaway* referred to the metric used to measure the process loss in oil-filling operations and was defined as the percentage of oil filled that was greater than the quantity mentioned in the product label.

Oil giveaway % = %

For example, in a 500-millilitre (ml) wide-mouth jar, the standard quantity of coconut oil to be filled was 500 ml. However, due to the capability constraints of the filling machines, the actual quantity of oil would be 503 ml. In such cases, the additional 3 ml corresponded to the oil giveaway loss and was expressed as a percentage of standard quantity, [i.e., (503 − 500) ÷ 500 = 0.6%, which was the percentage of oil giveaway].

The variation of oil giveaway for the most recent financial year is shown in Exhibit 8. NORPL’s commercial reconciliation sheet for February 2017 (see Exhibit 9) shows the comparison of the actual quantity of oil filled against the specified quantity of oil to be filled.

THE SHOP FLOOR MEETING

A shop floor meeting was called on March 15, 2017. The attendees of the meeting included the following:

Madhav Kumar: The director of the plant (operations), the first line of command for all production- and maintenance-related activities that formed part of the manufacturing and packaging division. At the age of 52, he had extensive experience in the fast-moving consumer goods and beverages industries. Besides working on process design and improvements, enterprise value creation, and supply chain management, Kumar had also been a key player in establishing strategic alliances with upstream and downstream stakeholders in the value chain, thereby contributing significantly to both the top and bottom lines of the company.

Vinod Sharma: The production executive of the packaging division who had rich experiences in oil and foods manufacturing and packaging industries. With 12 years of experience, Sharma was a certified six sigma green belt holder. He had headed cross-functional projects on lean management in departments such as raw material handling and finished goods dispatch departments. While he had a penchant for analyzing data and driving insights, he had poor interpersonal skills and exhibited undiplomatic behaviour, which made him unpopular with the other executives.

Aditya Jaiswal: The maintenance executive of the manufacturing and packaging division. An energetic mechanical engineer by education, he had six years’ experience in the maintenance divisions of food and beverages industries. His proactive nature and effervescent attitude helped him build good rapport with the shop floor operators and the top management alike. He liked to challenge the status quo and innovate. Jaiswal had initiated and successfully implemented a filtering technique in the manufacturing division, which had significantly increased the product quality. His proactive nature helped him cultivate a good relationship with Kumar.

**TRANSCRIPT OF THE MEETING**

At the shop floor meeting, the following discussions took place:

Kumar: You all are well aware that the company is facing an oil giveaway issue. The figures for last month are alarmingly high, and the data show an increasing trend. And even though we have discussed this issue several times before, we have not been able to tackle it. Management has given us clear-cut instructions that we must resolve it in this quarter. What do you have to say about this, Sharma?

Sharma: Sir, I am aware of the gravity of the situation and my team is already working on specific projects to improve efficiency and reduce these kinds of losses. However, due to poor spares supply and vendor issues, we have not been able fully to implement these improvements.

Kumar: I have been hearing these excuses for a long time now. Show me some signs of progress that you have made in these projects. What data do you have to support your arguments?

Sharma: We have been collating supporting information for some time now. However, the data are still in the initial phase. And as we are also missing some data points in the daily production report (DPR), we are unable to analyze correctly. We are still working on the data.

Kumar (looking at the DPR): I can also see some entries missing in the DPR, especially in the “Actual filled quantity” column, which I believe refers to some critical parameters of the process. Why is this data missing?

Sharma (answering with a straight face): Yes, I understand that these are some of the critical parameters of the process. The operators of the filling machine are supposed to make these entries but sometimes miss recording these readings. I have tried talking to them but to no avail. Most of them feel that they are experienced enough and can manage even by bypassing some of the basic procedures in the packaging process.

Kumar: Seriously? Is this your analysis of the oil giveaway? I really don’t think I can communicate these excuses to the board. Sharma, it is high time you improve your work.

Sharma: Yes, sir, I will. However, I do want to make one crucial point. I have collected data on some maintenance activities as well. In the case of the pouch line, I found that the machine broke down twice a week last month. Also, I didn’t find the maintenance activities to the mark. As the number of breakdowns increase, the time window available to us to make minute adjustments on the machines to control the oil giveaway reduces. And because of this constraint, many times we have to run these lines without performing the fine-tuned adjustments and this shoots up the oil loss. I have been talking about this for some months, but no action had been taken.

Jaiswal, who was listening patiently till now, sprang into action.

Jaiswal: I do not agree with Sharma. The machine may have broken down a few times, but you can’t attribute this to poor maintenance alone. These machines are run by semi-skilled and unskilled operators who sometimes may operate them without following the standard operating procedures. So, don’t blame the entire maintenance team for all the breakdowns in the packaging division.

Kumar: As far as I know, the maintenance activities in the packaging division are carried out by semi-skilled operators of the maintenance team, right? Why are we giving critical maintenance activities to these semi-skilled operators? Can’t we bring in some skilled operators for these essential works? Remember, “a rolling stone gathers no moss.”

Jaiswal: Sir, most of the time, the skilled operators are busy with the maintenance activities in the manufacturing division. In fact, I have tried to take preventive measures and use skilled labour for maintenance activities when they are free. However, the production executives do not allow us to stop the machines for maintenance, saying that it would affect their production planning.

Kumar: So, Sharma, as I understand it, you are not fine with preventive maintenance activities but okay when the machine stops functioning because of a breakdown?

Sharma: Sir, as far as I know, this is the only option available to us in the existing system. We cannot stop our lines as per the convenience of other people. We are always on our toes and our schedule is very tight, so it is very difficult for us to stop work and give up the machines to the maintenance people. Moreover, these people don’t bother about our service levels and delivery. We are the ones who must ensure that the goods are finished on time even amidst this confusion.

Kumar: Can I see the history card[[9]](#footnote-9) for the pouch line?

Jaiswal handed it over to Kumar (see Exhibit 10).

Sharma: I am also doubtful about the quality of the spares we are purchasing. I have seen that many times, the material of construction (MOC[[10]](#footnote-10)) of shafts, keys, and other spares do not adhere to the quality specifications, and this leads to quicker wear and tear. I have highlighted this to the maintenance team several times, but the issue had not been addressed so far. So now we are left to shoulder the blame for all the breakdowns.

Kumar: What do you have to say, Jaiswal?

Jaiswal: Yes, sir, unexpected breakdowns happened several times. First, most of our machines are not upgraded. Also, our monthly production plans are very tight and so we are forced to procure spares from local vendors rather than original equipment manufacturers (OEMs). However, most of the times we do prefer to purchase from OEMs.

Kumar: Why are we not maintaining a minimum inventory level for these spares? How about the adage, “dig your well before you are thirsty”?

Jaiswal: Sorry, sir. As of now, we are not doing this because of the numerous constraints we face. For one, the finance department had limited the maximum inventory value of spares that we can maintain in our factory.

Kumar (agitated): You know what guys, there is a limit to everything. I have less than 24 hours before my meeting with the board and listening to you, I know that we are in a great deal of trouble. Now listen to me very carefully. I want both of you to sit together and make a report on all the critical issues you are facing and then design an action plan to resolve the oil giveaway issue. Primarily, I want you, Sharma, to do a reconciliation and calculate the actual oil giveaway figures of this month to date. I want both reports on my desk before 6 p.m. today. All of you please note that the state government has recommended that it would provide coconut oil as an edible oil under the Public Distribution System (PDS) in the state. As suppliers of this oil, this would mean a great opportunity for us and I want us to be ready to encash it.

Kumar returned to his office and once again considered that if the issue of the exponential oil giveaway losses was not resolved immediately, it would severely weaken the company’s bottom line. And even with his meeting with the board the next day, he still had not come up with a solution, which made him nervous. His thoughts were broken by Sharma’s sudden entry into his office. He was carrying the reconciliation sheet in his hand and looked very tense. Kumar glanced through the report, and his eyes froze on the oil giveaway statistics for March 2017. As he stared at the figures, a shiver ran down his spine. The oil giveaway, as per the calculation, was 1.2 per cent. He took a deep breath and said aloud the quote that came to his mind—“It seems that the cure is worse than the disease.”

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**EXHIBIT 1: namratha oil refineries PVt. Ltd. ORGANIZATIONAL CHART**

Note: CEO = chief executive officer; HR = human resources; ER = employee relations.

Source: Company document.

**EXHIBIT 2: namratha oil refineries PVt. Ltd. REVENUE STATISTICS, 2001–2016**

**(in ₹ Millions)**

Note: ₹ = INR = Indian rupee; ₹1 = US$ 0.015 on July 22, 2016.

Source: Company document.

**EXHIBIT 3A: namratha oil refineries PVt. Ltd. PROFIT AND LOSS STATEMENTs, 2012–2016 (in ₹ millions)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year ended March 31st** | **2016** | **2015** | **2014** | **2013** | **2012** |
| **Revenues** | 1,060 | 1,000 | 940 | 920 | 900 |
| Cost of revenues | 530 | 503 | 432 | 442 | 396 |
| **Gross profit** | **530** | **497** | **508** | **478** | **504** |
| **Operating expenses** |  |  |  |  |  |
| Research & development | 74 | 80 | 64 | 64 | 81 |
| Sales & marketing | 233 | 200 | 216 | 192 | 198 |
| General & administrative | 85 | 82 | 73 | 73 | 75 |
| **Total operating expenses** | **392** | **362** | **353** | **330** | **354** |
| **Income from operations** | **138** | **135** | **154** | **149** | **150** |
| Interest and other income (expense), net | (8.69) | (9.50) | (5.64) | (6.90) | (6.21) |
| **Pre-Tax income** | **129** | **126** | **149** | **142** | **144** |
| Income tax provision | 46 | 45 | 56 | 52 | 53 |
| **Net income** | **83** | **81** | **93** | **89** | **91** |

Note: ₹ = INR = Indian rupee; ₹1 = US$ 0.015 on July 22, 2016.

Source: Company documents.

**EXHIBIT 3B: namratha oil refineries PVt. Ltd. BALANCE SHEET, 2012–2016**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **At March 31 (in millions)** | **2016** | **2015** | **2014** | **2013** | **2012** |
| **Assets** |  |  |  |  |  |
| **Current assets** |  |  |  |  |  |
| Cash and cash equivalents | 325 | 297 | 229 | 243 | 224 |
| Short-term investments | 198 | 189 | 170 | 135 | 155 |
| Accounts receivable | 212 | 231 | 199 | 154 | 170 |
| Inventories | 168 | 139 | 128 | 116 | 123 |
| Prepaid expenses and other current assets | 28 | 29 | 26 | 14 | 22 |
| Total current assets | 931 | 885 | 752 | 662 | 694 |
| **Long-term assets** |  |  |  |  |  |
| Plant, property, and equipment, net | 145 | 132 | 128 | 125 | 120 |
| Intangible assets, net | 32 | 30 | 31 | 29 | 27 |
| Other assets | 16 | 11 | 12 | 13 | 10 |
| Total long-term assets | 193 | 173 | 171 | 167 | 157 |
| Total assets | 1,124 | 1,058 | 923 | 829 | 851 |
| **Liabilities and stockholders’ equity** | | | |  |  |
| **Current liabilities** |  |  |  |  |  |
| Accounts payable | 95 | 79 | 82 | 83 | 91 |
| Accrued payroll and other liabilities | 52 | 45 | 41 | 37 | 33 |
| Warranty reserve | 5 | 7 | 10 | – | 9 |
| Total current liabilities | 152 | 131 | 133 | 120 | 133 |
| **Long-term liabilities** |  |  |  |  |  |
| Warranty reserve | 29 | 23 | 20 | 21 | 16 |
| Notes payable, less current portion | 75 | 71 | 76 | 79 | 65 |
| Total long-term liabilities | 104 | 94 | 96 | 100 | 81 |
| **Stockholders’ equity** |  |  |  |  |  |
| Common stock | 565 | 565 | 400 | 400 | 525 |
| Retained earnings | 303 | 268 | 294 | 201 | 112 |
| Total stockholders’ equity | 868 | 833 | 694 | 601 | 637 |
| Total liabilities and stockholders’ equity | 1,124 | 1,058 | 923 | 821 | 851 |

Source: Company documents.

**EXHIBIT 4: namratha oil refineries PVt. Ltd.’s OIL EXTRACTION PROCESS**

Copra Silo

Hammer milling machine

Cooker

First stage Expeller

Second stage Expeller

Cake silo

Vibro sieve

Filter press

Farm tanks

Copra

Cutting process

Cut copra

Cooking process

Cooked copra

Fine copra particles

Single filtered Coconut oil

Unfiltered Coconut oil

Expelling process

First stage cake

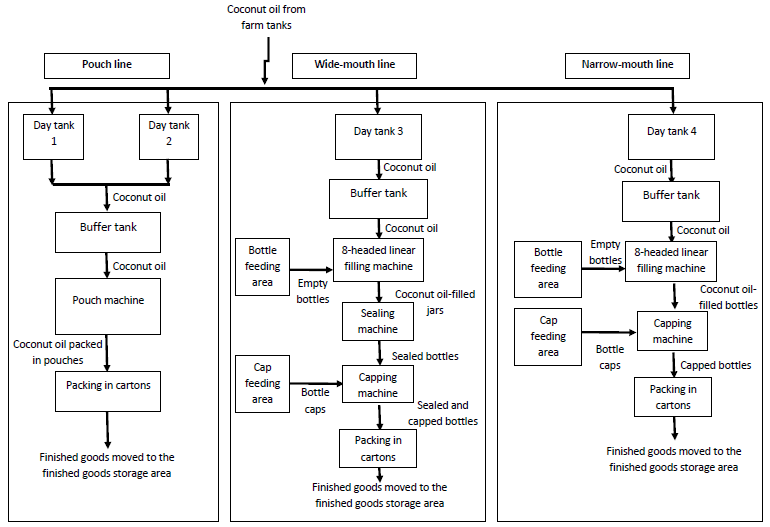
Double filtered Coconut oil

Filtration process

Final cake

Source: Company documents.

**Exhibit 5: namratha oil refineries PVt. Ltd.’s Filling Units’ Process Flows**



Source: Company documents.

**EXHIBIT 6: namratha oil refineries PVt. Ltd.’s** **OPERATOR TASKS AND RESOURCE UTILIZATION IN POUCH, WIDE-MOUTH LINE, AND NARROW-MOUTH LINES**

Table 6.2 Resource Requirements in Wide-Mouth and Narrow-Mouth Lines

Table 6.1 Resource Requirements in the Pouch Line

|  |  |  |  |
| --- | --- | --- | --- |
| **Process** | **Task Description** | **Labour Content**  **(in seconds)** | **Number of Operators** |
| Filled oil weight & quality inspection | Manual checking of the filled quantity of oil and quality of the primary package | 3 | 1 |
| Packing & sealing in poly packs | Pouch products are packed in secondary packages called poly packs | 2 |
| Packing in cartons | Pouches in secondary packages are packed and sealed in cartons | 2 | 1 |
| Movement of packed cartons to finished goods store | Finished cartons after batch coding are moved to finished goods store using trolleys | 1 | 1 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **Wide-Mouth Line** | | **Narrow-Mouth Line** | |
| **Process** | **Task Description** | **Labour Content**  **(in seconds)** | **Number of Operators** | **Labour Content**  **(in seconds)** | **Number of Operators** |
| Bottle feeding | Manual feeding of empty bottles | 2 | 1 | 2.4 | 1 |
| Filled oil weight & quality inspection | Manual checking of the filled quantity of oil and quality of the primary package | 3 | 1 | 3 | 1 |
| Cap feeding | Manual feeding of caps | 0.5 | 1 | 0.5 | 1 |
| Packing in cartons | Jars or bottles are packed and sealed in cartons | 1.5 | 1 | 1.2 | 1 |
| Movement of packed cartons to finished goods store | Finished cartons after batch coding are moved to finished goods store using trolleys | 1 | 1 | 1 | 1 |

Source: Company documents.

**EXHIBIT 7: namratha oil refineries PVt. Ltd.’s 2016–17 FILLING PLAN**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Filling Plan** | | | |
| **Month** | **Pouch Line** | **Wide-Mouth Line** | **Narrow-Mouth Line** | **Total Quantity for the Month** |
| Apr-16 | 263 | 97 | 152 | 512 |
| May-16 | 220 | 56 | 196 | 472 |
| Jun-16 | 256 | 48 | 155 | 459 |
| Jul-16 | 233 | 54 | 183 | 470 |
| Aug-16 | 150 | 86 | 206 | 442 |
| Sep-16 | 297 | 62 | 115 | 474 |
| Oct-16 | 292 | 60 | 120 | 472 |
| Nov-16 | 110 | 86 | 220 | 416 |
| Dec-16 | 241 | 98 | 173 | 512 |
| Jan-17 | 240 | 100 | 180 | 520 |
| Feb-17 | 284 | 57 | 134 | 475 |
| Mar-17 | 302 | 56 | 151 | 509 |

Source: Company documents.

**EXHIBIT 8: namratha oil refineries PVt. Ltd.’s OIL GIVEAWAY TRENDs FOR Fiscal Year 2016–17 (in percentage)**

Source: Company documents.

**EXHIBIT 9: namratha oil refineries PVt. Ltd.’s ACTUAL QUANTITY FILLED versus SPECIFIED QUANTITY FOR FEBruary 2017 (in kilolitres)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Filling Lines** | | | **Total Quantity for February 2017** |
|  | **Pouch Line** | **Wide-Mouth Line** | **Narrow-Mouth Line** |
| **The actual quantity of oil filled** | 286.9820 | 134.3216 | 57.0684 | 478.3720 |
| **The quantity of oil to be filled as per specification** | 284 | 134 | 57 | 475 |
| **The giveaway amount** | 2.9820 | 0.3216 | 0.0684 | 3.3720 |

Source: Company documents.

**EXHIBIT 10: namratha oil refineries PVt. Ltd.’s HISTORY CARD for the POUCH LINE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Namratha Oil Refineries Pvt. Ltd.** | | | | | |
| **Format No:** | NORPL/2010/R8 | | | | |
| **M/c Name** | Pouch machine | | | **Location/Area** | |
| **M/c make** | Aravindam machines | | | Pouch line/Packaging | |
| **Model No.** | LKM/15-16-1998 | | |
| **Date** | **Breakdown Details** | **Nature of Breakdown** | **Maintenance Details** | **Breakdown Time**  **(in minutes)** | **Spare Parts Consumed** |
| 15.09.2016 | Pneumatic hose failure | Pneumatic hose failed due to extended use | Hose replaced | 20 | 1 metre of pneumatic hose |
| 21.10.2016 | Clutch plate failure | Plate failure due to wear & tear | Clutch plate replaced; Misfit of shaft key in clutch plate adjusted with manual filing | 180 | 1 clutch plate, 1 shaft key |
| 05.12.2016 | Non-return valve (NRV) failure | NRV spring failure | Spring of specification not available. Non-standard spring used instead | 60 | 1 spring  (non-standard) |
| 18.02.2017 | Pneumatic cylinder failure | Seal kit damaged | Seal kit replaced | 240 | 1 seal kit |
| 22.02.2017 | Pneumatic cylinder failure | Piston failure | Seal kit replaced, piston replaced | 360 | 1 seal kit, 1 piston set |

Source: Company documents.

1. Oil giveaway was a metric used to measure the efficiency of oil filling and packaging operations. A detailed explanation provided in the section “The Oil Giveaway Issue.” [↑](#footnote-ref-1)
2. Tiptur, which was famously known as “kalpataru nadu,” meant “land for coconut plantation.” [↑](#footnote-ref-2)
3. Copra was a late 16th-century Malayalam word for raw dry coconut, and was the main ingredient of coconut oil. [↑](#footnote-ref-3)
4. 1 tonne = 1,000 kilograms. [↑](#footnote-ref-4)
5. Information in this section comes from NORPL. [↑](#footnote-ref-5)
6. Vibro sieves were machines used to achieve the required product specification and quality. They worked on the basis of the vibratory motion of sieves that filtered the unwanted or oversized particles from either a liquid or powder. [↑](#footnote-ref-6)
7. An eight-headed linear filling machine had eight volumetric cylinders arranged linearly. In this machine, eight bottles were filled during one stroke of operation. [↑](#footnote-ref-7)
8. 1 kilolitre = 264.172 gallons. [↑](#footnote-ref-8)
9. The history card was a record that contained data regarding various maintenance activities carried out on a line/equipment. [↑](#footnote-ref-9)
10. Material of construction, or MOC, was the material with which a spare or component was manufactured. [↑](#footnote-ref-10)