RESEARCH ARTICLE OPEN ACCESS

A Case Study of Availability of the SWANTEX M700 Overlock Machine Based on Maintenance

Satyam Kumar Sinha[1*], Vanshika[1], Vinoth Rengaraj[2]
[1] Student, Department of Fashion Technology, National Institute of Fashion Technology, Patna, Bihar 800001
[2]Assistant Professor, Department of Fashion Technology, National Institute of Fashion Technology, Patna, Bihar 800001
* Corresponding author mail id: Satyam.sinha2@nift.ac.in

----------**********----------

Abstract:
Overlock machines are widely used in apparel production for joining fabric and finishing raw edges, and their consistent performance depends on disciplined maintenance. This paper presents a maintenance management study of the SWANTEX M700 industrial overlock machine, based on the M700 series instruction manual. The machine is described in terms of its technical specification, major components, working principle and the key adjustments of the needle, feed, looper, knife and tension systems. A structured maintenance plan is then proposed, covering daily, weekly, monthly, quarterly, half-yearly and yearly activities with task-wise time estimates, together with lubrication, cleaning and safety practices. Machine downtime is classified into planned maintenance, unplanned faults, administrative delays and external factors. For a working week of 6 days of 8 hours (2880 min), the total downtime is estimated at 195.9 min, giving a machine availability of about 93.2%.

Keywords - **Overlock Machine, SWANTEX M700, Planned Maintenance, Downtime, Availability**

----------**********----------

I. INTRODUCTION

The SWANTEX M700 is an industrial overlock machine used for joining and finishing fabric edges. It forms an overlock stitch while controlling the fabric edge and thread formation, which makes it suitable for apparel production where clean, secure and durable seams are required [1]. The maintenance and downtime of sewing machines have been reported to affect productivity and quality in garment, footwear and textile production [2]–[5]. Standard apparel manufacturing, sewn-product machinery and quality texts describe the same production context [20]–[25]. Because the machine runs repetitively in a production environment, its reliability is directly linked to routine maintenance and safe operation, both of which are emphasised in the supplied M700 manual.

The supplied manual is titled for the PEGASUS M700 Series and specifically shows the M732 series safety-stitch machines and the M752 series overedgers. The machine is available in India at an approximate price of ₹16,000–₹30,000 and generally uses a 3-pin plug with earthing. As the exact SWANTEX nameplate specifications may differ, they should be verified on the actual machine. The front view of the machine is shown in Fig. 1.



Fig. 1 Front view of the M700 overlock machine

An M700-type overlock machine is applied in edge finishing, where it creates a neat finished edge and helps prevent fabric fraying; in seam joining of suitable garment constructions; in industrial production, as it is designed for repetitive sewing work; and in garment preparation operations such as side seams, edge overlocking and finishing.

 ©IJSRED: All Rights are Reserved

The objective of this paper is to describe the machine and its adjustments, to propose a structured maintenance schedule with time estimates, and to quantify the machine availability by classifying all sources of downtime.

II. TECHNICAL SPECIFICATION

The technical information that is supported by the manual is summarised in Table I.

TABLE I
TECHNICAL SPECIFICATION OF THE M700 SERIES

Parameter	Source-supported information
Series	M700
Reference manual	Pegasus M700 Series
Machine types in manual	M732 / M752 families
Operation	Industrial sewing / overedge work
Machine rotation	Clockwise when viewed from machine pulley side
Maximum speed	7000 RPM
Lubrication oil	High speed sewing machine oil, ISO VG22
Belt tension during installation	Approx. 2 cm deflection at the center when pressed

III. MAJOR COMPONENTS AND MACHINE LAYOUT

The key areas that must be identified before operating or maintaining the machine are the needle, presser foot, needle plate, feed rows (feed dogs), upper and lower loopers, thread tension controls, handwheel (machine pulley), upper and lower knives, oil pan and lubrication points, and the motor, pulley and belt. These are indicated in Fig. 2.

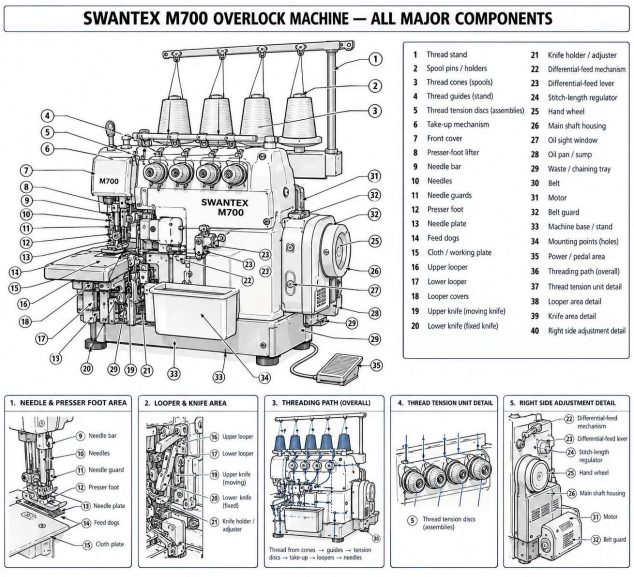


Fig. 2 Major components of the SWANTEX M700 overlock machine

A. Machine layout

For maintenance purposes the machine can be divided into four operating zones: the threading zone (thread guides, tension and thread path), the sewing zone (needle, presser foot, needle plate and feed area), the cutting zone (knife area near the fabric edge) and the drive zone (machine pulley, belt and motor). The zones are indicated on the machine in Fig. 3.

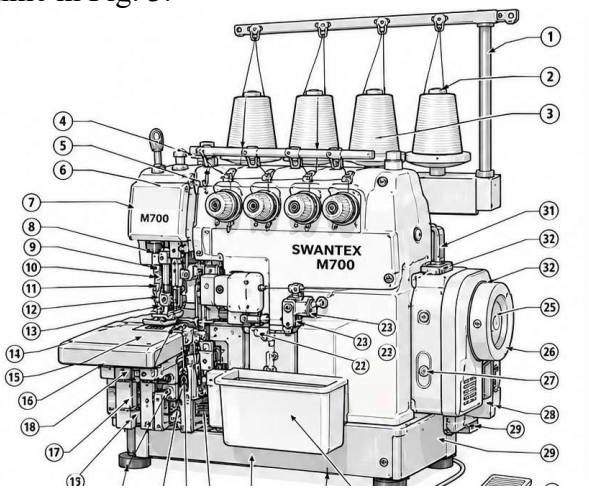


Fig. 3 Machine layout: threading, sewing, cutting and drive zones with numbered components (from Fig. 2)

B. Needle and presser-foot area

The needle must be inserted to the proper depth and fastened securely, with the needle scarf facing toward the rear of the machine. Only the specified standard needle should be used. The presser-foot

 ©IJSRED: All Rights are Reserved

pressure should be only as strong as necessary for proper stitch formation. The needle and presser-foot area is shown in Fig. 4.

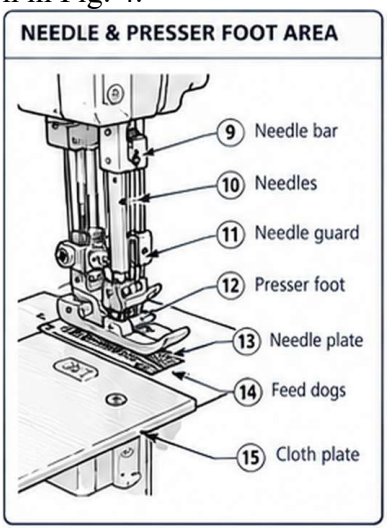


Fig. 4 Needle and presser-foot area

C. *Feed and differential feed*

The feed rows move the fabric through the sewing area, so the feed area must be kept clean to keep fabric movement consistent. For the differential-feed adjustment the manual instructs to loosen the nut, move the lever to the required position and then tighten the nut. The differential-feed mechanism, its lever and the stitch-length regulator are shown in Fig. 5.

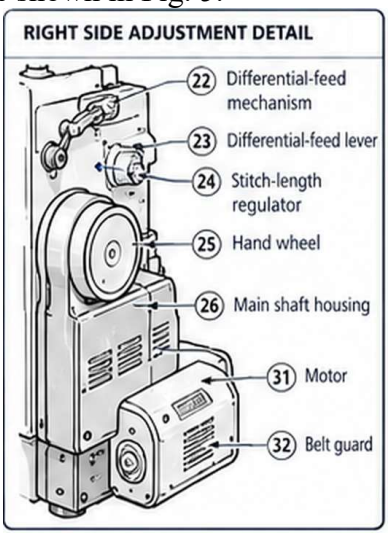


Fig. 5 Right-side adjustment detail: differential-feed mechanism and lever, stitch-length regulator, handwheel

D. *Loopers and thread path*

Correct threading is essential for stitch formation. The machine covers are opened as required and the presser foot is swung aside where necessary. When rethreading, the new thread is tied to the thread already in the machine and pulled through to the needle or looper area; knots are cut neatly before the needle or looper eye. The complete path must finally be verified against the threading diagram on the machine before sewing. The overall thread path from the cones to the needles is shown in Fig. 6.

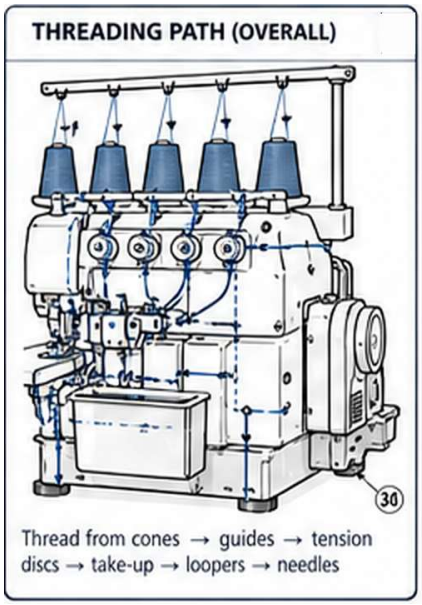


Fig. 6 Overall threading path: cones, guides, tension discs, take-up, loopers and needles

E. *Knife and edge-trimming system*

The lower knife is a maintenance component and must be installed at the correct level and position. To replace it, the specified screw is loosened, the knife holder is moved, the knife is installed and the screw is tightened securely. A cutting-action check is performed afterwards. Because the cutting edge is a moving working part, knife adjustment must be carried out carefully (Figs. 7 and 8).

 ©IJSRED: All Rights are Reserved

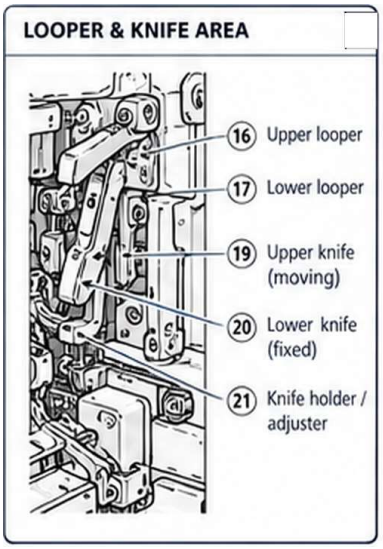


Fig. 7 Looper and knife area: upper and lower loopers, upper (moving) and lower (fixed) knives, knife holder

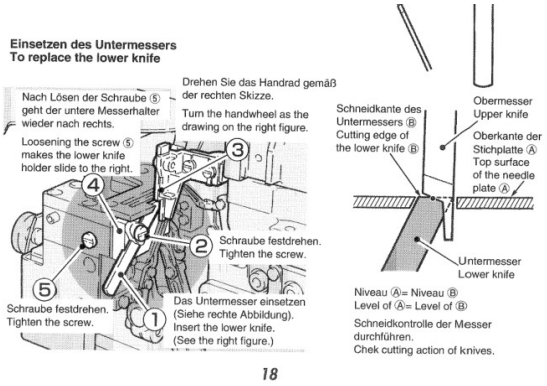


Fig. 8 Removing and replacing the lower knife (manual illustration)

F. Stitch length, tension and presser-foot pressure

Stitch length is set by pressing the push button, turning the handwheel to the required position and setting the desired scale. The manual notes that stitch-length adjustment should be made after changing the differential-feed ratio. Separate tension controls are provided for the needle thread, upper looper thread and lower looper thread, and the presser-foot pressure should be set as light as possible while still producing proper stitch formation. A test piece should always be sewn after any adjustment to check fabric movement and stitch appearance. The thread-tension unit and its adjustment discs are shown in Fig. 9.

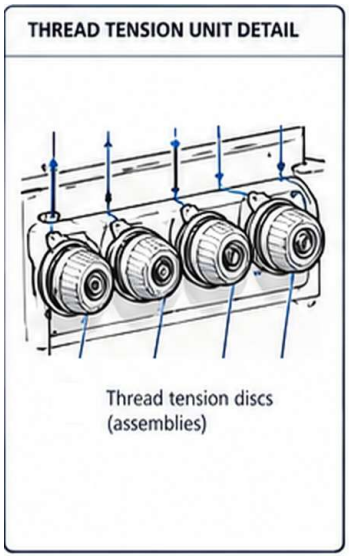


Fig. 9 Thread-tension unit: tension disc assemblies

IV. WORKING PRINCIPLE

An overlock sewing cycle can be simplified into six stages. (1) Thread supply: threads are guided from the thread stand through the machine guides and tension controls. (2) Needle penetration: the needle carries thread through the fabric at the sewing point. (3) Looper action: the loopers interact with the needle thread to form the overlock stitch around the edge. (4) Fabric feed: the feed mechanism moves the fabric forward at the selected feed setting. (5) Edge trimming: where fitted, the knives trim excess edge material before or alongside stitch formation. (6) Finished edge: the result is a secured and finished fabric edge. The stages are marked on the schematic in Fig. 10 and summarised as a flow in Fig. 11.

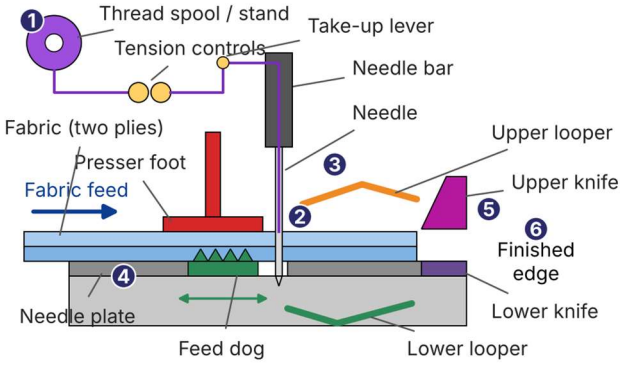


Fig. 10 Working methodology of the overlock machine: 1 thread supply, 2 needle penetration, 3 looper action, 4 fabric feed, 5 edge trimming, 6 finished edge

 ©IJSRED: All Rights are Reserved

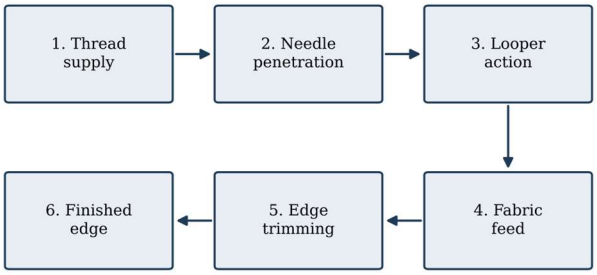


Fig. 11 Simplified sequence of an overlock sewing cycle

V. MAINTENANCE MANAGEMENT

A. Types of maintenance

A practical classification of maintenance for the M700 is as follows [6], [7]. Routine (daily) maintenance consists of cleaning, visual checks, thread-path checks and basic safety inspection. Preventive maintenance is the scheduled lubrication, adjustment and inspection carried out before failures occur. Corrective maintenance is the repair or replacement performed after a fault, abnormal noise, poor stitch or damaged part is found. Condition-based maintenance inspects the machine based on symptoms such as oil circulation, stitch quality, wear or unusual operation [11]. Safety maintenance covers guards, covers, power isolation and safe working practices, and service maintenance is the periodic detailed inspection by trained or qualified personnel. These categories follow the standard maintenance terminology [7] and the total productive maintenance approach [8], [9], in which maintenance is planned together with production [10].

B. Lubrication

The manual recommends high speed sewing machine oil, ISO VG22. After filling the oil pan, the oil level should remain between the H and L marks, and oil is added when the level reaches L or falls below it (Fig. 12). After a first start or a long stoppage, the indicated points are oiled manually with 2–3 drops. The correct oil must be used and areas not specified by the manual should not be over-lubricated.

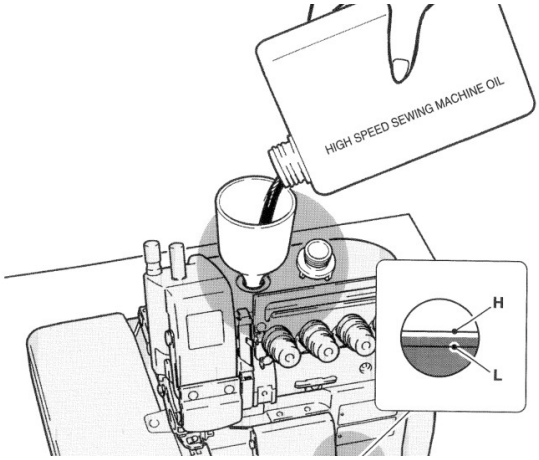


Fig. 12 Filling the oil pan and oil-level marks (H and L)

C. Checking oil circulation

The manual provides an oil-circulation check while the machine is operating (Fig. 13). Proper lubrication reduces friction and supports smooth machine operation. If circulation is abnormal, the machine must be stopped and the lubrication system inspected before production continues.

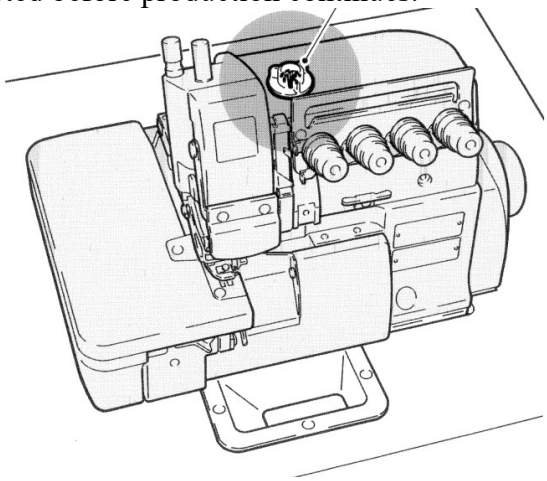


Fig. 13 Checking oil circulation during operation

The oil can also be changed through the drain of the oil pan (Fig. 14); the correct oil must be used and the pan refilled to the level between the H and L marks.

 ©IJSRED: All Rights are Reserved

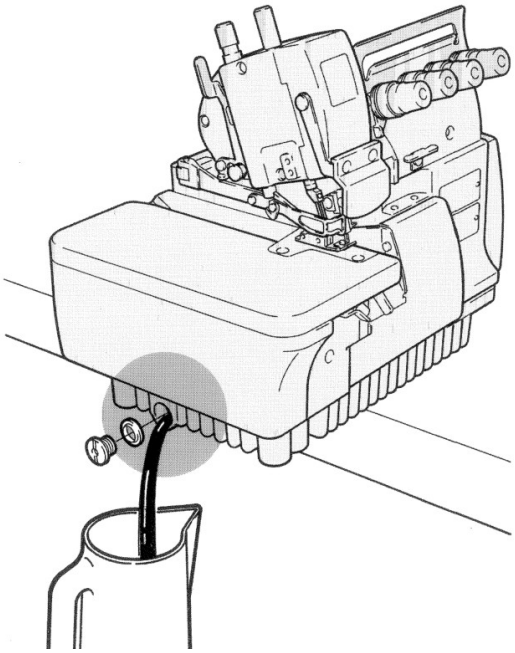


Fig. 14 Draining the oil pan during an oil change (manual illustration)

D. Cleaning and routine care

The needle-plate slots and the feed-dog area should be cleaned regularly, and lint, thread waste and fabric debris removed from accessible areas (Fig. 15). The machine table and surroundings must be kept free of unnecessary tools and objects, and the machine must always be switched off before cleaning.

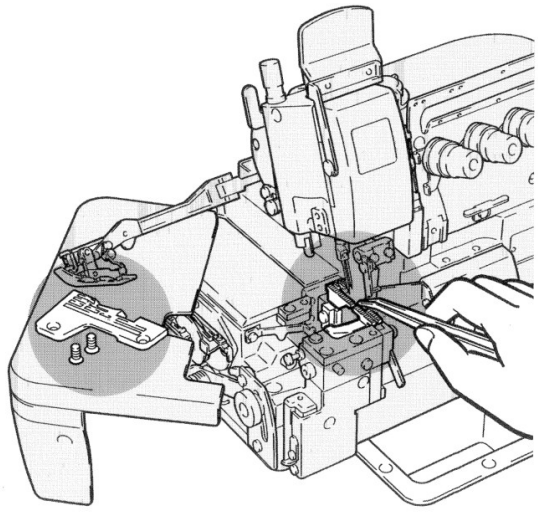


Fig. 15 Cleaning the needle-plate slots and feed-dog area

E. Needle replacement

The machine is switched off before the needle is replaced. The new needle must be the standard needle specified for the machine; its scarf faces the rear of the machine, it is inserted to the proper depth and fastened securely using the yellow-handled hex driver supplied in the accessory box (Fig. 16).

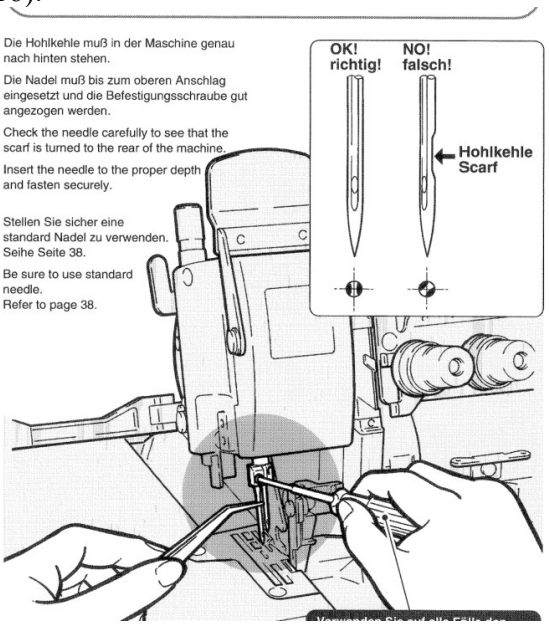


Fig. 16 Replacing the needle: correct needle orientation with the scarf to the rear (manual illustration)

VI. PLANNED MAINTENANCE SCHEDULE

The recommended schedule for an academic maintenance plan comprises six frequencies: daily, weekly, monthly, quarterly, half-yearly and yearly. The task-wise activities and the time taken for each are given in Tables II–VII. The time for each task is estimated in minutes.

A. Daily maintenance

TABLE II
DAILY MAINTENANCE

S.No	Maintenance task	Action required	Time (min)
1	Machine shutdown and preparation	Switch off the machine and prepare a cleaning cloth and brush.	1
2	Lint and thread waste cleaning	Remove lint and thread waste from accessible machine areas.	2
3	Needle and presser-foot inspection	Check needle condition and ensure the presser foot is properly seated.	2
4	Thread path inspection	Check the threading path for incorrect threading or visible damage.	2

 ©IJSRED: All Rights are Reserved

S.No	Maintenance task	Action required	Time (min)
5	Final check and record	Clear the work area and record any issues found.	1
Total			**8**

B. Weekly maintenance

TABLE III
WEEKLY MAINTENANCE

S.No	Maintenance task	Action required	Time (min)
1	Machine shutdown and preparation	Switch off machine and prepare tools.	1
2	Feed dog and needle-plate cleaning	Remove accumulated lint and thread waste.	4
3	Thread tension and stitch check	Check tension and sample stitch quality.	4
4	Fasteners and wear-part check	Check visible screws, presser foot and wear.	3
5	Final check and record	Record findings and clean the work area.	2
Total			**14**

C. Monthly maintenance

TABLE IV
MONTHLY MAINTENANCE

S.No	Maintenance task	Action required	Time (min)
1	Power isolation and preparation	Switch off machine and prepare service area.	1
2	Detailed accessible cleaning	Clean lint and residue around accessible areas.	5
3	Oil level/circulation check	Check oil level and circulation if applicable.	3
4	Knife inspection	Inspect upper/lower knives for wear or damage.	4
5	Stitch and moving-part inspection	Check stitch consistency, tension, noise and wear.	5
6	Guard and fastener inspection	Check covers, guards and visible fasteners.	3
7	Drive-system inspection	Inspect belt and drive components.	3
8	Test run and service record	Run a short test and record observations.	6
Total			**30**

D. Quarterly maintenance

TABLE V
QUARTERLY MAINTENANCE

S.No	Maintenance task	Action required	Time (min)
1	Preparation and power isolation	Isolate power and prepare service tools.	3
2	Detailed cleaning	Clean accessible machine areas thoroughly.	10
3	Moving-part wear inspection	Inspect major moving parts for wear.	10
4	Drive-system inspection	Inspect belt and drive components.	5
5	Timing and adjustment check	Check timing/adjustments as required.	10
6	Electrical and safety inspection	Check electrical condition and safety devices.	7
7	Test run and stitch check	Test operation and inspect stitch quality.	10
8	Documentation and cleanup	Record results and clean work area.	5
Total			**60**

E. Half-yearly maintenance

TABLE VI
HALF-YEARLY MAINTENANCE

S.No	Maintenance task	Action required	Time (min)
1	Preparation and power isolation	Isolate power and prepare for service.	3
2	Detailed cleaning	Clean accessible internal/external areas.	10
3	Major wear-part inspection	Inspect knives, needle mechanism and wear parts.	15
4	Lubrication-system inspection	Check lubrication system and oil circulation.	15
5	Drive and moving-component inspection	Inspect belt, drive and moving components.	10
6	Timing and adjustment check	Check timing and adjust if required.	15
7	Performance test	Test machine and check stitch consistency.	15
8	Service documentation	Record faults, actions and replacement needs.	5
9	Final cleanup and handover	Restore guards and clean service area.	2
Total			**90**

 ©IJSRED: All Rights are Reserved

F. Yearly maintenance

TABLE VII
YEARLY MAINTENANCE

S.No	Maintenance task	Action required	Time (min)
1	Preparation and power isolation	Isolate power and prepare full service.	5
2	Detailed cleaning	Clean accessible components and remove residue.	15
3	Component inspection	Inspect internal/external components for wear.	15
4	Wear-part replacement allowance	Replace worn parts if required.	15
5	Lubrication-system service	Check lubrication system and oil passages.	10
6	Timing and adjustment check	Inspect and adjust timing as required.	15
7	Drive and safety-system inspection	Inspect drive system, guards and safety devices.	10
8	Test run and stitch verification	Test machine and verify stitch quality.	20
9	Service record and handover	Document service and recommendations.	5
10	Final cleanup	Clean service area and return machine to use.	10
Total			**120**

The yearly service is to be carried out as a complete preventive service by qualified personnel, reviewing safety and the overall condition of the machine.

VII. SAFETY PRECAUTIONS

The following precautions are given in the manual [1]. The machine must not be operated without its safety devices and covers, and tools or unnecessary objects must not be left on the machine table during operation. Before maintenance, adjustment, cleaning, threading or needle replacement the power must be turned off; for clutch-motor setups it should be confirmed that the machine does not run when the pedal is pressed after the power is off. Hands must be kept away from the moving needle, looper and knife areas, and covers and guards must be restored before normal production. These precautions are consistent with the general principles of safety of machinery [12]; further maintenance and safety context is given in [13].

VIII. DOWNTIME ANALYSIS

Downtime is any period in which the machine is not available for production. It is taken as the sum of planned maintenance, unplanned (failure) time, administrative delay and external factors [14]:

Downtime = Planned maintenance + Unplanned faults + Administrative delay + External factors

A. Planned maintenance downtime

The maintenance times of Tables II–VII are converted to a weekly basis in Table VIII, assuming a 6-day working week, 4 weeks per month, 13 weeks per quarter, 26 weeks per half-year and 52 weeks per year. The total planned maintenance downtime is 79.9 min per week. The contribution of all four downtime categories is compared in Fig. 17.

TABLE VIII
PLANNED MAINTENANCE DOWNTIME PER WEEK

S.No	Frequency	Time per occasion (min)	Occasions per week	Weekly time (min)
1	Daily	8	6	48.0
2	Weekly	14	1	14.0
3	Monthly	30	1/4	7.5
4	Quarterly	60	1/13	4.6
5	Half-yearly	90	1/26	3.5
6	Yearly	120	1/52	2.3
Total				**79.9**

B. Unplanned maintenance

Unplanned faults are grouped into stitching and thread-related faults, mechanical and fabric-feed faults, and drive, electrical and lubrication faults. Typical examples with the action required and the estimated time are listed in Table IX; the total unplanned downtime is 66 min.

TABLE IX
UNPLANNED MAINTENANCE EXAMPLES

S.No	Unplanned issue	Action required	Est. time (min)
1	Thread breakage	Check threading, thread path, tension and needle.	1
2	Skipped stitches	Check needle condition, threading and looper/needle setting.	2

 ©IJSRED: All Rights are Reserved

S.No	Unplanned issue	Action required	Est. time (min)
3	Uneven stitch formation	Inspect tension settings, thread path and stitch formation.	3
4	Needle breakage	Stop machine; replace needle and check alignment/material obstruction.	2
5	Thread tension failure	Inspect tension discs, guides and thread take-up path.	2
6	Blade / knife jam	Isolate power; remove trapped material safely and inspect knife area.	3
7	Fabric jamming	Stop machine; remove fabric carefully and check feed path.	2
8	Irregular fabric feeding	Check feed dogs, presser-foot pressure and differential-feed setting.	3
9	Belt slipping / damage	Inspect belt condition, alignment and tension; replace if damaged.	5
10	Looper damage	Do not continue sewing; inspect and arrange replacement by a technician.	10
11	Machine fails to start	Check supply, plug, switch and visible cable condition; escalate if unresolved.	3
12	Motor overheating	Stop machine; allow it to cool and check ventilation/overload signs.	5
13	Excessive vibration / noise	Stop and inspect for loose parts, belt issues or abnormal contact.	5
14	Oil leakage	Stop machine; identify leak area and check oil level/seals.	10
15	Abnormal oil circulation	Check oil level and visible circulation indicator; call technician if absent.	10
Total			**66**

C. *Administrative delay*

Administrative delays arise from waiting rather than from the fault itself. The example values are given in Table X.

TABLE X
ADMINISTRATIVE DELAY EXAMPLES

S.No	Delay type	Description	Time (min)
1	Notification lag	Time before issue is reported	5
2	Technician response	Wait for maintenance technician	10
3	Stores and parts retrieval	Wait for tools or spare parts	10
4	Supervisor approval	Wait for authorisation to issue parts or proceed with repair	5
5	Work order documentation	Logging breakdown details and filling the maintenance slip	5
6	QC sign-off	Wait for quality checker to approve test stitch before restart	10
Total			**45**

D. *External factors*

External causes lie outside the control of the maintenance team. As an illustrative example, a power-supply issue is taken, for which the machine waits for supply to be restored or checked (Table XI).

TABLE XI
EXTERNAL FACTORS

S.No	External factor	Action required	Time (min)
1	Power supply issue	Wait for power supply to be restored or checked	5

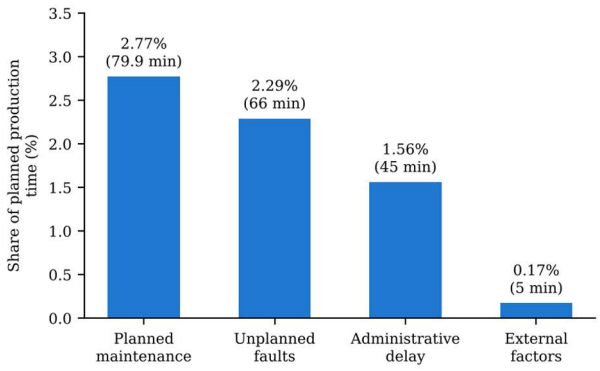


Fig. 17 Weekly downtime by category (share of planned production time)

IX. MACHINE AVAILABILITY

Machine availability is the proportion of the planned production time for which the machine is actually operating [14], [15]:

Availability = (Operating time ÷ Total planned production time) × 100

The total planned production time is one machine working 8 hours a day for 6 days a week, i.e. TT = 1 × 8 × 60 × 6 = 2880 min. The downtime components of the previous section are combined in Table XII.

 ©IJSRED: All Rights are Reserved

TABLE XII
MACHINE AVAILABILITY CALCULATION (PER WEEK)

Item	Calculation	Time (min)
Total planned production time (TT)	1 × 8 × 60 × 6	2880
Planned maintenance downtime	Table VIII	79.9
Unplanned downtime	Table IX	66
Administrative delay	5+10+10+5+5 +10	45
External factor	Power supply issue	5
Total downtime (DT)	79.9 + 66 + 45 + 5	195.9
Operating time (UT)	TT − DT = 2880 − 195.9	2684.1

$$Availability = 2684.1 \div 2880 \times 100 = 93.2\ \%$$

Planned maintenance, unplanned faults, administrative delay and external factors account for about 2.77%, 2.29%, 1.56% and 0.17% of the planned production time respectively (Fig. 17), so that the machine is unavailable for about 6.8% of the time. Planned maintenance is the largest single contributor, followed by unplanned faults and administrative delay, and planned maintenance is also the component that is deliberately scheduled to reduce the likelihood of unplanned faults. Availability and downtime are also used as indicators in maintenance performance measurement [16], [17].

X. CONCLUSIONS

The SWANTEX M700 overlock machine requires correct operation, regular cleaning, lubrication and inspection. Correct threading, needle installation, feed settings and thread tension support consistent stitch quality, while safety covers, power isolation and careful maintenance procedures are essential. A structured maintenance schedule helps to reduce avoidable breakdowns and supports reliable production. For the assumed working week the total downtime is 195.9 min and the machine availability is about 93.2%.

XI. FUTURE WORK

The unplanned, administrative and external downtime values used here are illustrative examples, and the exact SWANTEX nameplate specifications should be verified on the actual machine. Recording real fault and delay data over several weeks would allow the availability to be recalculated from measured values, and condition-based inspection of oil circulation, stitch quality and wear could further reduce unplanned downtime. Predictive maintenance [18] and reliability-based replacement planning [19] are possible extensions.

REFERENCES

[1] Pegasus M700 Series Instruction / Service Manual (supplied with this assignment): introduction, machine speed, lubrication, cleaning, needle replacement and oil-circulation check sections.

[2] J. Reyes, K. Alvarez, A. Martínez, J. Guamán, “Total productive maintenance for the sewing process in footwear”, Journal of Industrial Engineering and Management, 11(4), 2018, 814–822. https://doi.org/10.3926/jiem.2644

[3] A.K.M. Masud, Abdullah-Al-Khaled, S. Jannat, A.K.M.S.A. Khan, K.J. Islam, “Total Productive Maintenance in RMG Sector: A Case: Burlingtons Limited, Bangladesh”, Journal of Mechanical Engineering, The Institution of Engineers, Bangladesh, ME37, June 2007.

[4] T. Puspita, R.M. Sari, “Maintenance Management Analysis to Improve the Effectiveness of Single Needle Sewing Machines at PT Alendros Global Production”, International Journal of Management Science and Information Technology, 6(2), 2026, 2258–2273. https://doi.org/10.35870/ijmsit.v6i2.8280

[5] I. Herrera-Barreda, “Enhancing Operational Efficiency in Textile SMEs: Integrating Lean Manufacturing and Total Productive Maintenance for Superior Performance”, Proceedings of the 5th Asia Pacific Conference on Industrial Engineering and Operations Management, Tokyo, 2024, 396–411. https://doi.org/10.46254/AP05.20240101

[6] R. Keith Mobley, Lindley R. Higgins, Darrin J. Wikoff, “Maintenance Engineering Handbook”, McGraw Hill, 2008.

[7] EN 13306:2017, “Maintenance – Maintenance terminology”, European Committee for Standardization (CEN), 2017.

[8] S. Nakajima, “Introduction to TPM: Total Productive Maintenance”, Productivity Press, Cambridge, MA, 1988.

[9] I.P.S. Ahuja, J.S. Khamba, “Total productive maintenance: literature review and directions”, International Journal of Quality & Reliability Management, 25(7), 2008, 709–756. https://doi.org/10.1108/02656710810890890

[10] B.S. Dhillon, “Engineering Maintenance: A Modern Approach”, CRC Press, 2002.

[11] A.K.S. Jardine, D. Lin, D. Banjevic, “A review on machinery diagnostics and prognostics implementing condition-based maintenance”, Mechanical Systems and Signal Processing, 20(7), 2006, 1483–1510.

[12] ISO 12100:2010, “Safety of machinery – General principles for design – Risk assessment and risk reduction”, International Organization for Standardization, 2010.

[13] Mitsubishi M700/M70 Maintenance Manual (used only as supporting maintenance and safety context; not the machine-specific manual for the SWANTEX M700).

[14] Charles E. Ebeling, “An Introduction to Reliability and Maintainability Engineering”, McGraw Hill, 1997.

[15] P. Muchiri, L. Pintelon, “Performance measurement using overall equipment effectiveness (OEE): literature review and practical application discussion”, International Journal of Production Research, 46(13), 2008, 3517–3535. https://doi.org/10.1080/00207540601142645

 ©IJSRED: All Rights are Reserved

[16] P. Muchiri, L. Pintelon, L. Gelders, H. Martin, "Development of maintenance function performance measurement framework and indicators", International Journal of Production Economics, 131(1), 2011, 295–302.
[17] L. Swanson, "Linking maintenance strategies to performance", International Journal of Production Economics, 70(3), 2001, 237–244.
[18] R. Keith Mobley, "An Introduction to Predictive Maintenance", Elsevier Science, 2002.
[19] A.K.S. Jardine, A.H.C. Tsang, "Maintenance, Replacement, and Reliability: Theory and Applications", CRC Press, 2nd ed., 2013.
[20] Rajkishore Nayak, Rajiv Padhye, "Garment Manufacturing Technology".
[21] Gerry Cooklin, "Introduction to Clothing Manufacture".
[22] Harold Carr, Barbara Latham (updated by David J. Tyler), "Carr & Latham's Technology of Clothing Manufacture".
[23] T. Karthik, P. Ganesan, D. Gopalakrishnan, "Apparel Manufacturing Technology".
[24] Patty Brown, Janett Rice, "Sewn Product Industry Machinery and Equipment".
[25] Pradip V. Mehta, Satish K. Bhardwaj, "Managing Quality in the Apparel Industry".

 ©IJSRED: All Rights are Reserved