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Case Study: Maintenance Schedule for Feed-Off-The-Arm Double Chain Stich Machine JUKI 1190

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Abstract:

In high-speed garment manufacturing, keeping specialized machinery running smoothly is essential to maintain product quality and keep output targets on schedule. The JUKI MS-1190 Feed-Off-The-Arm double chain stitch machine plays a critical role in forming lap seams on tubular garment parts like shirt sleeves, trouser inseams, and denim items. This paper presents a comprehensive case study evaluating the maintenance management strategy and availability for the JUKI MS-1190. We outline the machine's primary mechanical components, working principles, and thread paths, establishing a structured preventive maintenance routine across daily, weekly, monthly, half-yearly, and yearly intervals. Furthermore, we analyse lost production time by categorizing planned servicing, component failures, administrative delays, and external factors. Adopting this systematic maintenance model helps industries prevent major operational delays while maintaining consistent stitch accuracy during heavy-duty apparel assembly.

Keywords - Feed-Off-The-Arm, JUKI MS-1190, Chain Stitch, Maintenance Schedule, Machine Availability, Downtime Analysis, Planned Maintenance.

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I. INTRODUCTION

In modern garment manufacturing, standard flatbed lockstitch machines face structural limitations when assembling three-dimensional or tubular garment components [1]. Operations such as joining sleeve inseams, executing trouser crotch seams, and forming lap-jointed side seams on heavy denim garments require specialised material handling to navigate tight geometric constraints [2]. Where conventional flatbed surfaces restrict continuous fabric flow around tubular structures, cylinder-bed and feed-off-the-arm architectures provide the necessary accessibility for unobstructed seam formation [1, 3]. Among these specialised systems, the JUKI MS-1190 Feed-Off-The-Arm Double Chain Stitch machine is widely recognised as a benchmark machine for high-strength, heavy-duty seam assembly [4].

Unlike conventional lockstitch machines (ISO stitch type 301) that rely on limited-capacity bobbin spools requiring frequent manual replenishment, the JUKI MS-1190 operates on a continuous multi-thread system [3, 4]. It generates a 4-thread double chain stitch (ISO stitch type 401) using two upper needles and two lower oscillating loopers supplied directly from large thread packages [4, 6]. This inter-looping mechanism produces a soft, flexible seam with high structural elasticity, allowing the stitch line to stretch alongside the base fabric without suffer seam popping under tensile stress [3, 6].

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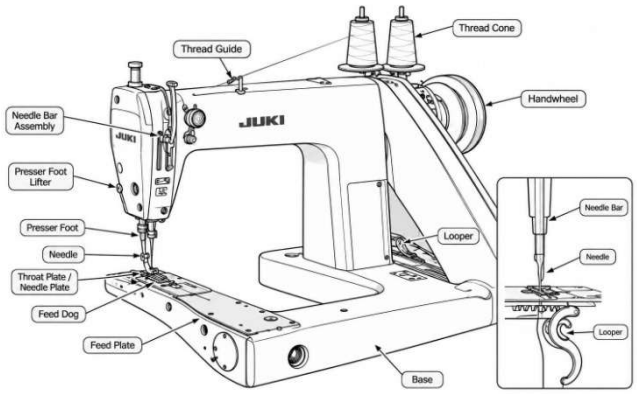


Fig. 1 JUKI MS-1190 working methodology

II. MAJOR COMPONENTS

A. Needle Bar

The needle bar mechanism drives the dual needles through multi-layered fabric structures to establish consistent penetration depth. Precise vertical travel is necessary to form uniform thread loops under the throat plate. Mechanical play in the needle bar bushing or improper timing adjustments frequently lead to skipped stitches, needle deflection, or fabric fiber damage [2, 3].

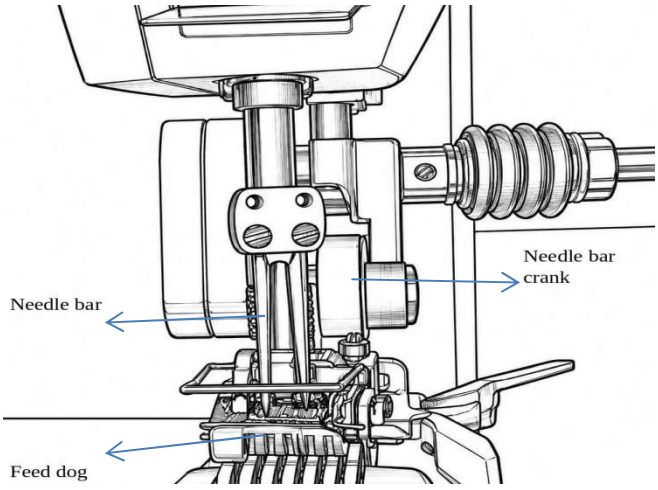


Fig. 2 Needle Bar

B. Looper

Operating beneath the throat plate, the oscillating loopers swing horizontally to capture needle thread loops and interlock them with lower looper threads. Because loopers clear the needle clearance zone by fractions of a millimetre, any surface burrs, timing drift, or tip wear can cause thread shearing, severe skipped stitches, or total chain breakdown [1, 4].

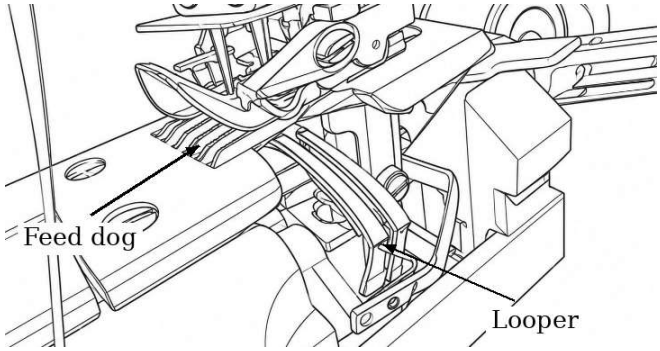


Fig. 3 Looper

C. Feed Dog

The feed dog works in conjunction with the presser foot to advance the fabric by a designated stitch pitch after each cycle. Consistent tooth height and feed timing are vital for maintaining uniform seam length; inadequate pressure or tooth wear often results in material slippage, seam puckering, or inconsistent stitch density [3, 5].

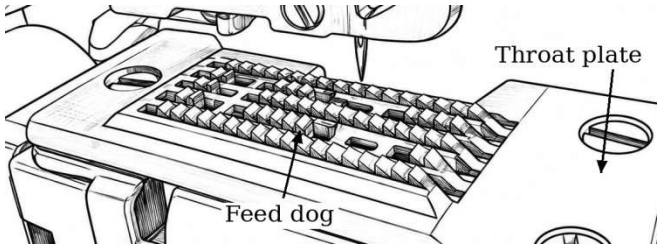


Fig. 4 Feed Dog

D. Lapped Seam Folder

The specialised lap seam folder plays an indispensable role in automated garment assembly by folding raw edges into neat, overlapping fell seams before they enter the stitch zone. Any physical wear or improper mounting of this folder directly results in uneven seam widths, exposed raw edges, and crooked tubular joints, underscoring why regular inspection of these primary components is vital for overall seam integrity.

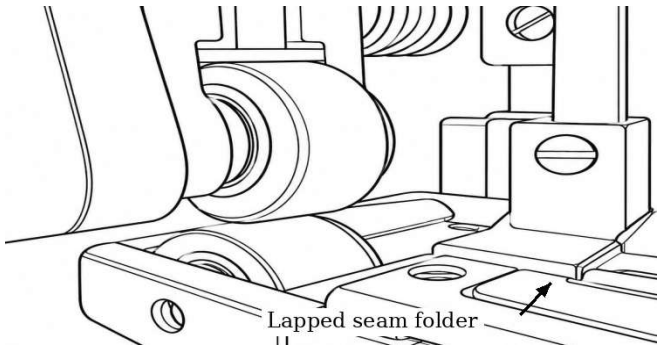


Fig. 5 Lapped Seam Folder

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III. MAINTENANCE

Industrial maintenance is not just about fixing machines when they break; it is a structured management framework designed to prolong equipment life, prevent quality defects, and minimize operating costs. To establish a standardized evaluation framework for maintenance allocation, routine servicing tasks for the JUKI MS-1190 are converted into normalized weekly minute metrics. This model assumes a standard industrial manufacturing schedule operating 10 hours per day across a 6-day work week, establishing a baseline of 2,880 planned operational minutes per week (or 11,520 minutes per month). Normalizing task durations into uniform weekly time units allows for precise quantitative comparison between daily routine cleaning, periodic functional inspections, and long-term mechanical overhauls.

A. Daily maintenance

TABLE I
DAILY MAINTENANCE

S.No	Activity	Time (min)
1	Remove lint/thread waste; keep guides clean	0.83
2	Check correct type/size, straightness and point	0.83
3	Look for lint, thread pieces and visible damage	0.67
4	Remove dirt and check free movement	0.67
5	Check the machine's oil condition/level as designed	0.67
6	Check the machine's oil condition/level as designed	1.33
	Total time	5.00

Total daily maintenance time in a week
= 5 x 6 = 30 minutes.

B. Weekly maintenance

TABLE II
WEEKLY MAINTENANCE

S.No	Activity	Time (min)
1	Clean carefully and inspect for damage	2
2	Clean and visually inspect	5
3	Clean and check alignment	5
4	Inspect visible belt and pulley condition	8
5	Look for loose screws / fittings	5
	Total time	25

Total weekly maintenance time in a week
= 25 minutes.

C. Monthly maintenance

TABLE III
MONTHLY MAINTENANCE

S.No	Activity	Time (min)
1	Check oil level in reservoir, inspect wick condition, top up with Juki New Defrix Oil No.1	5
2	Check feed dog height (0.8mm standard above throat plate) and pitch	8
3	Inspect clearance between looper and needle; check looper timing	10
4	Clean tension discs, check tension release mechanism	5
5	Inspect puller roller pressure, lifting mechanism, and belt condition	7
	Total time	35

Total monthly maintenance time in a week:
=35/4 = 8.75 minutes.

D. Half Yearly maintenance

TABLE IV
HALF YEARLY MAINTENANCE

S.No	Activity	Time (min)
1	Measure belt deflection (approx. 15mm sag under 9.8 N); adjust motor height	10
2	Check needle bar height, check presser foot alignment and spring tension	15
3	Inspect looper thread cam timing and thread guide clearance (0.5 mm – 1.0 mm)	15
4	Deep clean folder assembly, check mounting tightness and alignment with throat plate	10
5	Inspect power plug, connections, treadle linkage, and motor pulley cover	10
	Total time	60

Total Half yearly maintenance time in a week:
=60/26 = 2.31minutes.

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E. Yearly maintenance

TABLE V
YEARLY MAINTENANCE

S.No	Activity	Time (min)
1	Drain oil reservoir completely, flush sediment, clean oil filter/wick, refill with fresh Juki oil	25
2	Inspect arm/bed cover gaskets and seals for oil leakage; replace if hardened	15
3	Replace main V-belt and puller timing belt if showing cracks or wear	20
4	Inspect throat plate, feed dog, looper, and needle guard for micro-grooves; replace worn gauge set	30
5	Re-zero feed timing, looper rocking cam, and needle guard clearances to factory defaults	30
	Total time	120

Total yearly maintenance time in a week:
= 120/52 = 2.31minutes.

IV. DOWN TIME

Down time is defined as any period when a machine or system is non-operational and unable to perform its intended function, resulting in a halt in production activities [16]. To minimize such interruptions and extend the overall lifespan of equipment, maintenance activities are systematically carried out. While the maintenance schedule is planned and predictable, all other causes of downtime such as failure time, administrative delays and external factors are uncertain and vary depending on the nature of the problem [17].

Down time = Unplanned maintenance+ planned maintenance+ Administrative delay + External factors

Except for the maintenance planning, the rest of the causes of the downtime are unpredictable in nature. The amount of time spent on such interruptions will vary each time according to the particular case of the problem. In actual analysis, this time period is calculated based on the number of weeks, taking into account only the major problems affecting the machine's performance [18].

A. Planned Maintenance

TABLE VI
PLANNED MAINTENANCE

S.No	Activity	Time (min)
1	Daily maintenance	30
2	Weekly maintenance	25
3	Monthly maintenance	8.75
4	Half yearly maintenance	2.32
5	Yearly maintenance	2.32
	Total time	68.47

B. Administrative delay

TABLE VII
ADMINISTRATIVE DELAY

S.No	Activity	Time (min)
1	Electricity issue	4
2	Spare parts delay	3
3	Lack of scheduling and demand	6
4	Lack of experienced technicians	8
5	Inconsistent production method	10
	Total time	31

C. Unplanned maintenance

TABLE VIII
UNPLANNED MAINTENANCE

S.No	Activity	Time (min)
1	Needle breakage and replacement	8
2	thread breakage and re-threading	12
3	Looper timing drift (skipped stitches)	15
4	Feed dog failure (fabric slippage)	10
5	Machine jamming	15
	Total time	60

D. External factors

TABLE IX
EXTERNAL FACTORS

S.No	Activity	Time (min)
1	Environmental temperature and pressure	7
2	Workplace Cleanliness	10
3	Vibration	5
	Total time	22

V. CONCLUSIONS

Machine availability is one of the key performance indicators, which indicates how effectively the equipment has been utilized throughout its operating period. This factor considers both planned downtime, such as scheduled maintenance, and

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unplanned downtime caused by equipment failures or external factors.

By calculating availability, companies can determine how efficiently their machinery operates and assess its productivity over time. In simple terms, this metric represents the percentage of total available time during which the machine has been operating effectively.

$$Availability = \frac{Actual\ operation\ time}{Planned\ production\ time}\ x\ 100$$

or

$$Availability = \frac{Up\ time}{Total\ time}\ x\ 100$$

Total time = 1 week = 6 days = 6 * 8 Hours
= 6 * 8 * 60 min
= 2880 min

Down time = Unplanned maintenance+ planned maintenance + Administrative delay + External factors
= 60 mins + 68.47 mins+31mins + 22mins
= 181.4 minutes.

Up time = Total time – Down time
= 2880 – 181.4 mins
= 2698.5 minutes.

$$Availability = \frac{2698\ .5\ mins}{2880\ mins}\ x\ 100$$

= 93.69%

Planned maintenance, Unplanned maintenance, administrative delays, and external factors contribute to machine downtime by 2.38%, 2.22%, 1.14%, and 0.81%, respectively. Collectively, these factors account for 4.17% of the overall downtime. This has a direct adverse effect on production efficiency, highlighting the importance of minimizing unexpected interruptions and maintaining machinery in good working condition.

The JUKI MS-1190 demonstrates a weekly machine availability of 93.69%, indicating that the equipment operates under satisfactory conditions. This percentage reflects the effective utilization of the machine within its scheduled operating time. Regular planned maintenance plays a significant role in achieving this level of availability, as it not only extends the machine's service life but also helps reduce the likelihood of equipment failures.

VI. FUTURE WORK

Machine availability can also be improved by effectively minimizing downtime caused by different factors. Key elements such as equipment failure time, administrative delays, and external influences must be reduced to enhance overall operational efficiency. Particular attention should be given to areas involving equipment failures, as they account for a significant portion of unplanned downtime [19].

Implementing advanced maintenance strategies can significantly help reduce equipment failure time. These strategies include predictive and preventive maintenance approaches, which identify potential issues in advance and implement necessary corrective measures to prevent breakdowns, thereby ensuring the continuous and efficient operation of machinery [20].

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