

MKMS: Matrix Knit Monitoring System Return Overview

There is very good reason the term real-time has become such a popular term, when emphasizing the value, quality control software offers in all sectors of process manufacturing technology. Data collection is crucial and very useful in optimizing manufacturing efficiency, but unless that data collection is collected, analyzed and reported in real-time, your facility will simply be losing potential profits. These are profits that are easily obtainable, especially since your team has already taken the initial and essential steps towards data collection.

Matrix's F1000s and Infrared Scanners, have and are providing Textile Companies with the eight areas of production savings seen below, and that value can be seen in the following pages. You can now be confident in viewing, analyzing and reporting F1000 data in real-time, and collecting those additional profits. That goal will be accomplished with Matrix Central Monitoring or **(MKMS) Matrix Knit Management System**.

How can your company's management visualize additional savings from MKMS, savings on top of the impressive numbers seen in the following pages. Easily and simply by understanding that instead of 100 tasks (as an example) needing to be done on 100 machines, you are now looking at **one** task. And easily and simply by understanding when data is not looked at in real-time and centrally, often when data is finally ready to be viewed and reviewed, it is often time for the next set of reporting and analyzing to be done. Because the system is not in real-time, your decisions are never on time, which wastes time, effort and the bottom line, **money**. This last word is all that you need to know, when deciding to incorporate **MKMS**. Examples are to follow, but Matrix would like to keep it simple. Central, real-time data review will add to your bottom line. Additionally, you can be confident in the value of **MKMS**, by realizing that Matrix engineers were asked to design **MKMS** by our Textile Customers who themselves visualized, and now enjoy the value of Central Monitoring their **F-1000 Scanner/Monitor/Controllers**.

For specifics regarding the value of **MKMS**, consider the following. Without **MKMS** the supervisor can continue to look forward to a daily tour of the plant, manually entering the day's F1000 data. And although 2 minutes per machine (2 hours of avoidable effort per day) may not seem that bad, Matrix is more concerned with the element of human error involved with manual re-entry of data. With Central Monitoring, your task has been reduced to 1 minute per 100 machines (contrasted with 2 minutes/mach. X 100 machines/day), as you now have a view of the entire knitting mill floor in real-time, every time, and with the elimination of human error.

While on the topic of human error, consider the possibility that central monitoring affords you, when you can view the reaction time of personnel, knitters and operators, to a "downed machine". Before Central Monitoring, the Infrared Scanners might have reached threshold, and shut down production on a machine, and there was no way to monitor the reaction time to re-start the machine. Your company has prevented hundreds of yards of

defective fabric from being produced with scanning, and avoided wasteful finishing processes on defective fabric, and saved real money. Why give it back? Why give it back, by having that machine down for longer than necessary? With Central Monitoring, the supervisor immediately sees the “downed” machine and makes the call. Re-starts are immediate. In addition, management, at the end of the day/week/month, can see the efficiency and reaction times of their personnel. You will determine who your workers are, and who is not. And even more importantly, because historically the F1000/MKMS system has led to reductions in personnel turnover, you will be more likely to keep your workers. With **MKMS** you are no longer on the production floor looking across the plant, but rather have a relaxed aerial view of entire plant floor operations. It is a view that is in real-time, and offers owners/management complete data, analysis and reporting. And more importantly it is a view, which adds to your bottom line.

We spoke about the labor involved with collecting data from 100 machines verses 1 collection. Does the same apply to data entry? Of course. Consider a style change. Before MKMS, adding a style change to 100 machines, meant adding a style change to 100 machines. With Central Monitoring consider a click of the mouse, and sending that style change off to 100 machines. Whether it be taking data or inputting data, take comfort in reductions in labor, time, and human error, when Central Monitoring is active.

The above discussion alone is reason enough to begin Central Monitoring, and Matrix has not even mentioned the ability to click and drag machine display icons, the ability to build knitter sets (assignment of machines to knitters by date/shift), and 28 types of reports at your fingertips. Take a look at some of these reports:

- Shift Efficiency and Stops
- Exceptions by Machine Efficiency
- Exceptions by Style Efficiency
- Knitter Shift Production Summary
- Knitter Shift Production by Date
- Knitter Log On/Off Time Stamp
- Mechanic Log On/Off Time Stamp
- Shift Efficiency and Stops
- Exceptions by Machine Efficiency
- Piece Report
- Detailed Piece Report
- Auto Downtime Summary

- Detailed Auto Downtime
- Current Yarn Rates
- PM Counter (1-4)
- All PM Counters
- Currently Polled Machines
- Defects by Shift
- Maintenance History
- Currently Logged On Operators to F1000
- Scanner Configuration
- Exceptions by Style
- Downtime Summary
- Detailed Downtime

What follows is a discussion of the savings you will see with the **F1000/MKMS Monitoring System**. While you are reading each area of savings, Matrix would like you to mentally and visually insert the following paragraph →

“ With Central Monitoring you can be assured of even more savings, as management can react faster, allowing personnel to respond faster, while reducing the element of error in manual data entries, and limiting the labor and time involved with unnecessary and repetitive individual machine data collection and inputs. This will all be accomplished, while viewing the operations of the entire knitting mill from a

single PC, with reporting abilities that allow flexible drill down, into any, and all details of the plant floor. In addition, you will be able to optimize personnel selections, and be more apt to keep those individuals in your employment. Installing Central Monitoring will also optimize your initial investment of F1000s (if you've done so already), while leaving you open to future additions such as the Automated Scheduling Module.

The discussion begins with the most important aspect of any quality and production management system; that being company savings and increased annual profits. In the case of Matrix's Knit Monitoring System (MKMS) its assets cover an impressive eight areas:

Eight Areas of Production Savings

- A. Yarn Rate Monitoring Resulting in Yarn Savings and Yield consistency**
- B. Increased Efficiency Through Downtime Reduction**
- C. Machine Speed Increases Allowing Additional Production**
- D. Increased Efficiency Due to Yarn Quality Improvement**
- E. Improvement in Quality of Fabric (not included in total calculations):**
 - ↑ **Customer Satisfaction** → ↑ **Orders** → ↑ **Branding of Company's Reputation**
- F. Savings Due to Labor Reductions (Includes Improved Housekeeping/Preventive Alerts)**
- G. Reductions in Personnel Turnover**
- H. Fabric Defect Detection Ensuring Reduced Waste.**

The Matrix Knit Management System (MKMS) is made up of 2 primary components, the **F-1000 Scanner/Monitor/Controller (F-1000)** mounted on each of the knitting machines and the PC based **MKMS Software**. With the implementation of the Matrix Knit Management System, plants can typically achieve increases in productivity of 3 to 5%. In some cases we have seen greater than 10% improvements. Results, however, will differ for individual plants. Matrix IE Services provides support in determining productivity and savings opportunities and post implementation realization of those savings.

The Matrix Knit Monitoring System (MKMS) will reduce labor-intensive processes, provide accurate data and reporting, increase production, reduce downtime, increase efficiency, greatly improve fabric quality and enhance customer satisfaction leading to potential increased orders and profits to follow. Each of the above eight categories translates into short and long term cost savings, improved on-time delivery, improved efficiencies, and reduced work-in-process, as follows:

Improved productivity and efficiency

Mills measure productivity in a number of ways, but in any mill the goal is to produce **more first quality output at lower cost**, with **lower capital employed, faster and with more accuracy**. Knitting productivity and efficiency are determined in these four key ways. The MKMS impacts each of these areas to improve plant productivity. MKMS combined with our IE services can help mills in their TQM and ESA endeavors:

Reduced machine stops

Machine downtime is typically caused by fabric defects, yarn related stops, style changes/set-up times and preventive maintenance. The MKMS reduces the number of yarn related stops by monitoring Creel and Carrier Stops and fabric defects, both directly and indirectly. By setting limits to the number of point defects and forcing the operator to take action, the total number of repeated point defects is reduced. Substandard yarn can be flagged within hours, and corrective action taken. In addition, MKMS provides a scheduled maintenance plan based on accurate counts of machine revolutions and knit element life to reduce the number of defects due to improperly timed preventive maintenance.

Reduced machine downtime

The length of a stop is influenced by the type of stop, and the immediacy of the operator's response. MKMS combined with the visual display of the F-1000 provides the operator as well as production management **immediate knowledge of the stop reasons**, thereby helping the operator to **pinpoint** the remedy to the particular stop **faster**. By logging and reporting downtime events and providing visual software tools, knitters and mechanics are more aware of machines down, for how long, the reason and the most efficient process of getting the machines running again. In addition, it gives the operator the ability to prioritize the remediation of the stop when multiple machines are simultaneously stopped. Lastly, MKMS stop-time reporting provides feedback to the operator both generally as well as compared to other plant benchmarks to reduce the length of each particular stop.

Increased machine speed

By monitoring machine production efficiency and fabric quality, the F-1000 allows the machine speed to be increased. MKMS sets tolerances and can stop machines from the PC when out of tolerance conditions occur, while maintaining quality and efficiency. By increasing machine speed by just one rpm (very conservative) or **three rpm (typical)**, customers have generated **additional revenue in the thousands of dollars per machine per year**.

Improved production process coordination

Through a reduction in off quality, and greater production accuracy, lot/batch size requirements are met and the amount of re-knits and re-finishing is reduced. Over-knits are minimized, reducing the amount of over-knit

first quality fabric not saleable or otherwise having to be sold as second quality. Target-to-end dates are more accurate improving overall production scheduling, especially between knitting and dyeing, as well as in reduction of Greige Storage and Work-in-Process. It **improves the ability of a mill to 'knit to order' versus simply 'knit to inventory'**. Available resources for fabric inspection can be applied to those rolls that are known to contain defects.

With the additional features provided by the MKMS, operators, mechanics and management can maximize their performance to the benefit of the company. Use of downtime from the MKMS linked with the plant payroll and other internal systems accurately, quickly, fairly, with less manpower, improves payroll fairness and accuracy.

With the MKMS, more output for the same amount of capital employed can be achieved; fewer machines need to be purchased and labor reductions are automatic.

The integration of **APS, Automated Production Scheduling**, with **MKMS**, magnifies these savings even further. If a machine goes down, this powerful combination can direct an order to be re-routed production to another machine, obviously tremendously improving efficiencies.

Improved Fabric Quality

Through faster, automated and accurate **continuous yarn rate monitoring** and **defect detection** the F-1000 reduces the overall amount of off quality fabric produced. The productivity when calculated for first quality fabric production is increased. A one percent reduction in off quality fabric produced yields increases in mill productivity of one percent (conservative). Yarn rate monitoring tremendously reduces overfeeds and underfeeds, assuring that properly constructed fabric is sent to finishing reducing rework. Fabric defects are totaled and compared to a variable limit. When this limit is reached the machine is stopped and a supervisor code is required for restarting a machine. The roll can then be sent to visual inspection. This guarantees visual inspection of all bad rolls giving 100% inspection of defective rolls.

Fabric quality produced at any mill comes in three levels: first quality, second quality and rags. The higher the ratio of first quality to seconds and rags, the lower the cost of raw materials (yarn) and the higher the productivity of the mill. Fabric quality is influenced in **four ways**:

Yarn rate - The **F-1000's** continuous yarn rate monitoring capability via yarn rate transducers, allows strict tolerances to be maintained. Machines out of tolerance can be stopped by the PC, **preventing excess yarn usage and quality issues**. Reported yarn savings from existing users who were overfeeding by just two inches per revolution, has been as much as **\$2500.00 annually**

per machine. Reduction in refinishing fabric or waste fabric provides for additional savings.

Time spent on periodic audits is eliminated.

Overfeeding is known to cause a **lighter fabric-more porous with loops and a wider fabric**. This leads to more susceptibility to shrinkage and **excess yarn usage**, in addition to poor quality fabric and money wasted on unnecessary dyeing and finishing of defective product.

Underfeeding is no bargain either, as yarn is **wasted through the production of a heavier fabric, denser and narrower**. More yarn usage per revolution leads to loops that are smaller and again poor fabric quality, and again unnecessary dyeing and finishing. **MKMS prevents this vicious circle.**

Reduced running defects – Running defects are reduced in length to less than 12". The F-1000's ability to detect when the Scanner is not working prevents the machine from running without a working scanner.

Reduced point defects – Many point defects are caused by inadequate machine housekeeping and/or incorrect set-up. With the F-1000 Scanner/Monitor/Controller, limits can be set to stop the machine after reaching a set number of repeated point defects. Automatic air and oil control through the F-1000 reduces some of the lint related defects. Through periodic stops for manual inspection, defects not detectable by the scanner are also reduced.

In addition, Yarn Stop Monitoring identifies **poor quality yarn that leads to press-offs. can be detected, leading to requests/demands, from vendors for higher quality yarn.**

By analyzing the reported stop events, and using quality reports, our customers have been able to improve efficiencies by asking for better quality yarn from their suppliers. **Expected improvements from better yarn quality can increase overall efficiency by 5%, which results in annual cost savings of \$600.00 to \$700.00 per machine.**

DOGs (Dirt, oil and grease) – **DOGs** are typically caused by poor machine housekeeping. These defects are detected and recorded in the F-1000, and are used by production management to provide feedback to the operators to improve their housekeeping and processes.

Reductions of Labor Intensive Processes

MKMS will continually collect and report on valuable information and data produced by the knitting machines. **Mills without monitoring**, still must collect this data with some type of manual procedure. Typically, personnel go out to each machine at the end of each shift to collect revolutions knitted which have been counted by some kind of device. Additionally there may be a hand written mechanic's log on each machine reporting machine problems and possibly downtimes and reasons. This data is then processed manually and further processed by mill personnel to determine production, efficiency, preventive maintenance logs, knitter pay, knitter scheduling, etc...

This **labor intensive, time consuming operation** can take upwards of 4 minutes per machine, per shift. This includes a knitter's time for any data logging, a supervisor's time for totaling of figures, and a clerk's time for data entry and report production. There may even be an industrial engineer further processing the data. Additionally, if a written down time log is kept, there is the time for knitters and mechanics to write down times and reasons. There is **also the possibility of errors, inaccuracies, and forgetful-ness**. Supervisors may not approve the data for payroll and downtime in a timely fashion. At the end of each shift, the effort to do this could involve manually reading machine revolutions, logging them, picking up downtime sheets, approving the revolutions and the downtime, and additional processing by either the Industrial Engineering or Payroll Department, or both. With **MKMS** data is entered once, while manual entry requires repetitive entering, which further increases opportunities for error.

MKMS can perform all these functions automatically in a matter of seconds. It also eliminates all manual recording errors and the **possibility of excess revolutions** being given to preferred personnel. **MKMS** allows supervisors additional time for the critical areas of production, manufacturing, and decision-making, rather than generating manual paperwork.

Machine maintenance is another area where data can be collected, reported, and analyzed. Either a manual maintenance log is kept, or possibly the data is entered into a PC, and manipulated using some piece of software. The **MKMS** can provide all this functionality. It will provide early warning and overdue alarms if preventative maintenance reporting is not performed on time. Again, timesaving occurs and accuracy is improved, while downtime is also reduced with continuous scheduled machine maintenance.

Labor is also reduced with **MKMS'** automated oil and air purge features, and again, probabilities of reduced downtime are decreased with housekeeping skills improved.

Reductions in Personnel Turnover

Repeatedly customer testimonials have attested to reductions in personnel turnover, as the **MKMS** provides for **smoother operation on the plant floor**. It also provides for less chaos in operations, and a **working environment leading to greater productivity**, which will take the load off of human resources (**a budgetary allocation that is always expensive**), as personnel experience a more enjoyable work environment.

and

New Customers and Increasing Orders

With improved fabric quality, and **deliveries being made on time (MKMS and APS)**, your company can look forward to new customers, and additional orders (**Review the Proposal's Sample ROI**). We've stated that MKMS' ability to increase your knitting efficiencies across the board will allow fewer knitting machines to be active, but hold onto those machines. We'll put them back in use with your new increasing demands.

In Summary:

The MKMS software peaks performance and efficiencies, with real-time data, while producing major bottom line additions.