Down to the Wire

Over the years of working with many different companies, wire processing machine vendors have seen many ways to increase machine utilization and productivity for automatic termination machines. This article will discuss a few of the basic concepts. While for some, this may seem academic, going over the basics is a good reminder so as to avoid overlooking best practices.

By Rob Boyd

Schleuniger's CrimpCenter 64 fully automatic crimping machine

In the past, it was typical to see production batch sizes for automatic termination machines between 1,000 and 5,000 pieces or more. Most companies would simply make a large batch of parts and stock them until they were needed. Because of lean manufacturing and JIT production practices, the production environment and demands today are much different. Now, a large batch size would be 200 to 500 pieces. Some companies have an average batch size of 50 pieces or less. Automation continues to increase and machine production rates are higher than ever. With low batch quantities, set-up time is more than actual run-time so reducing set-up time and increasing machine utilization is critical.

Planning

Wire crimp samples

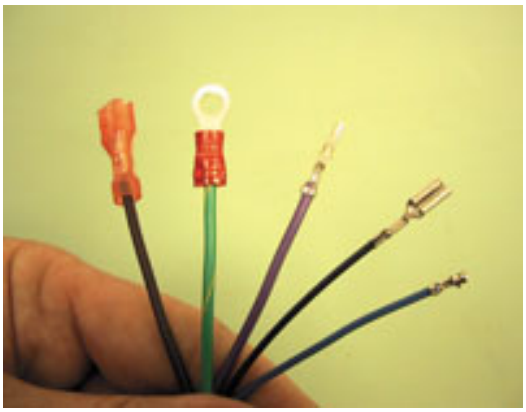
It's obvious that set-up times need to be reduced and everyone plans production to be as efficient as possible. Many companies group jobs based on terminal number. This minimizes the number of changes on a given press. However, something that many companies overlook is grouping jobs in terms of the longest change-over time for the application or terminal type. For instance, on today's machines, changing the wire is typically the fastest change, and terminal changes take longer. Most machines have quick-change wire guides where wire size can be simply programmed into the machine and it's done. However, changing from an open barrel terminal to a closed barrel terminal takes much more time than changing from a closed barrel to open barrel. Therefore, if jobs are grouped based on terminal type and not just terminal number, it will save considerable time on the production floor.

Material Preparation

Many companies plan well, but they are not good at preparing the next job. If all of the materials were available to the operator, machine changes, even on older machines, could take between five and ten minutes. However, set-up changes often take 30 or 40 minutes because the operator has to go search for materials. Meanwhile, the machine is sitting idle on the production floor. The most efficient companies have a system whereby the materials are gathered and brought to the machine before the job needs to be run. Depending on the number of machines they own, they may have dedicated people who only supply the operators with the required materials. These companies also have their materials and applicators very well organized so they are easy to find and move. This type of process may require an additional person or two, but if the machines are being changed 20 or 30 times a day, the additional machine utilization may pay for the additional person faster than one might think.

Applicator Preparation

All too often, operators and technicians make applicator adjustments on the machine. How much downtime could be eliminated if they did not have to make any adjustments to the applicator on the machines? The most efficient companies have a dedicated tooling area where applicators are set-up and inspected before jobs. Crimp height and pull test are verified for the given application. When the applicator goes to the production floor, it is ready to run. This applies for automatic machines and bench top crimping presses as well.In order for this concept to work, all of the crimping presses would need to be calibrated to have identical shut heights. Many presses today have electronic crimp height control. Regardless, the press shut height should be calibrated to a standard. The most common standard for press shut height is 5.346 inches (135.78 mm). Whether or not this value is used, the shut height dimension should be the same on all presses. If they are, the tooling area can set up the applicator, and when it is moved to another press, the same crimp height values are achieved.
Another consideration for applicators is compatibility with crimp force monitors. Many customers who are not familiar with crimp monitors overlook applicator quality. If an applicator or the tooling is not in good condition, the result may be excessive variation in the crimp force curves. Therefore, the monitor might give erroneous good/bad signals to the machine based on a worn applicator and not on the quality of the crimp. A dedicated tooling area could also evaluate the condition of each applicator and the tooling after it came off the production floor. Just this tip alone can save countless hours of down time when working with crimp force monitors.



Grouping jobs based on terminal type saves time on the production floor.

Material Quality

The most difficult wire to work with is curly or non-concentric wire when working with any automatic machine. The machines are designed around the assumption that the wire will be relatively straight and concentric. Curly wire affects both wire feeding and termination (e.g., crimp, tin, seal, etc.) and non-concentric wire obviously makes it difficult to strip properly.Some companies may attempt to save money by purchasing less expensive wire. Sometimes a lower price means lower quality and lower quality can result in lower productivity. Non-concentric wires will only reduce productivity because extra quality checks may be required. So

depending on the specific situation, lower cost wire may increase production costs by increasing downtime.

Material Packaging

When working with automatic machines, barreled wire is always preferred over spooled wire because spooled wire has more curl. This is especially true of spools with small inner cores and when the wire gets toward the end of a spool. Barreled wire is typically much straighter and much easier to work with.Spooled wire also usually requires a prefeed. Prefeed units may help with the memory, but the threading and unthreading of them during job set-up always takes more time. Furthermore, most prefeeding units will require reduced feed rates on the automatic termination machines because the prefeed can not keep up. Therefore, most prefeed units reduce productivity on automatic termination machines.
There are always exceptions to the rule and some barreled wire can be very curly. This can happen depending on the insulation type and wire quality. If the barreled wire is curly, speak with the vendor to determine if the quality can be improved.
If the company is investing considerable amounts of money on a new machine to improve productivity, in some cases, it may be necessary to invest a little more for higher quality materials so that the new machine can reach maximum productivity and the ROI is maximized as well.

Checking material quality during a new job run.

Quality Assurance

The optimal location for the QA devices is on the machine. The reason is simply to reduce the amount of time required to either walk over to the QA station or find the QA inspector. Also, if the QA devices can be integrated into the machine, the machine can be preprogrammed with the nominal test values and tolerances so the operators can perform the tests quickly and efficiently. They will not need to leave the machine, they will not need to search for the specifications, and there is less room for errors. QA will also have tighter control over the tests by removing any operator judgment during the test.

Preventative Maintenance

Without regular preventative maintenance (PM), machines can not be as efficient as when they were new. The most important and the easiest PM is regular cleaning. This can be achieved by simply having the operator take 10 minutes at the end of each shift to clean the machine. The best way to clean any machine is with a vacuum. Although compressed air is most commonly used, it can blow debris into areas where it shouldn't be.Every machine will come with a recommended PM program. However, it may be necessary to customize a program based on the environment the machine is in and the applications that are being run on the machine. For instance, is the production area generally very clean or is it very dirty and dusty? Furthermore, tinning applications require much more PM than simple crimping applications.
PM programs can be purchased from most manufacturers. Periodic reviews and calibrations by qualified technicians will keep a machine in top performance and make potential problems known before major problems occur. The additional expense of a good vendor PM program can save a lot of money in the future.

Schleuniger's CrimpCenter
64 fully automatic crimping machine fed with barreled wirethe preferred choice over spooled wire

Training

Ongoing training is incredibly helpful in terms of reducing the learning curve and maximizing machine efficiency. Obviously, the more the operators know about all aspects of the machine, the more efficient they will be. Therefore, when a new machine is purchased, companies should consider additional training sessions after the initial installation.For example, a common mistake the untrained operator will make is to automatically slow the machine down to solve a production problem. Sometimes this is necessary for difficult applications, but in many cases, it does not solve the root cause. With more training, operators will be able to find the real cause of the problem so the machine can run as fast as possible.
Service training is also crucial. Sending technicians for higher level training can increase machine uptime considerably over time. Ideally, the technicians would be autonomous so they could troubleshoot machine problems without the manufacturer's technicians.

Networking

If the machines have the capability, networking can significantly increase productivity. In some cases, it can virtually eliminate the need for programming jobs into the machine and drastically reduce set-up times. Jobs can be created off line and allocated to the appropriate machines. All job parameters can be downloaded so the operator only has to call up the job, quickly verify the set-up, and run production. When utilized correctly, networking can save countless hours of set-up time.

Conclusion

Some of these tips and suggestions may seem like common sense. However, it is not uncommon to observe companies falling into these pitfalls and losing productivity. Hopefully, these suggestions will aide in maximizing the productivity of automatic wire termination equipment.

Online
For additional information on the technologies and products discussed in this article, see MDT online at www.mdtmag.com or Schleuniger Inc. at www.schleuniger-na.com.

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