# iBL Case Study

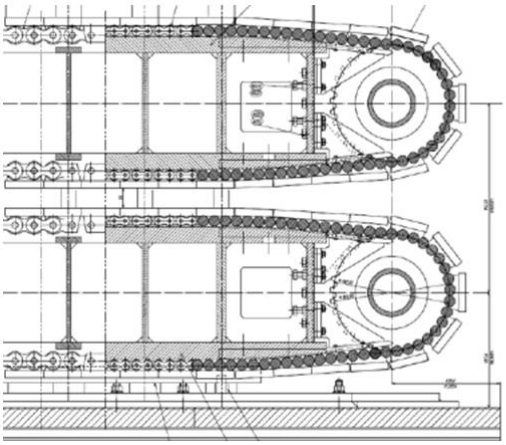
Our facility has a rather simple directive to safely convert natural resources (trees) into products for which customers will pay a reasonable margin which in turn enables us to provide a fair return to the shareholders who have invested their money in the assets that enable us to convert natural resources into products.
Our facility has determined that one of the best ways to ensure that not only are we safely operating our equipment but we are also utilizing our equipment wisely by incorporating equipment reliability. Maintenance, in conjunction with operations and materials management, has a significant role to play in helping our facility to achieve equipment reliability.
My focus line was the LVL manufacturing area of our facility. The primary focus I was tasked with as part of my iBL training, was to decrease scheduled machine outages throughout the Press Department, reduce the about of time spent on internal Press clean-up, and to extent the need to remove the heat from the press.
Our facility obtains the raw materials to manufacture our product from three other nearby facilities (within a 100 mile radius). This Plant is the main driver for two of the three supply plants to continue to operate. This shifts a great deal of responsibility on the plant to reliability run. If our facility is down, not only does this impact the associates at this facility, but at the other facilities as well.

**The improvement process:**

In August of 2014, my Maintenance Mgr & I sat down to come up with a project for my iBL training. The plan that we came up with seemed way too ambitious. Reduce scheduled downtime by a certain percentage.
In September of 2014 prior to my initial iBL training, I discussed my project with operations & members of the management team. I was very clear that at the time I wasn't sure how we were going to accomplish this daunting task, but somehow we would find a way.
Upon returning from the iBL Kickoff in October, I knew in order to tackle some of the tasks that had been set before me, we needed a game plan. From extensive meetings between maintenance and operations our first order of business was to convert our press lubrication from grease to oil. Not only was this a good business decision, it was also an excellent decision where safety is concerned. Converting the lubrication from grease to oil we saw a dramatic decrease in internal press fires, there was also less of a need for internal press cleanings. We had a 60% decrease of internal press fires after we converted from grease to oil.

We also spent a great deal of effort in the reduction of how much lubrication we use and how we apply lubrication to our press. With this different prospective of how we lubricate our presses. We had to think of the press as a giant bearing. If we think of our press as a bearing, we should lubricate it the same way. Generally when lubricating a bearing you want to apply the lubrication on the unloaded point. By simply changing this mindset we were able to use similar technologies for bearing lubrication and applied this to our equipment. Through trial and error we found that by applying small amount of oil to the top of the inner rolls at the head shaft area was the fastest way to lower our amp draw. We conducted test to utilize the top-top lubrication

ports which had been added to the newer press, but we had not been utilizing them.




We also evaluated of different types of oil. Our company currently does not have any standard for type lubrication, brand or even a standard for lubrication application. It is the ultimately the decision of the plant as to what type and style of lubrication is used for the press. There are several good brands to choose from and applications available.

When deciding on a lubricant a few things you want to consider.

- Temperature/Flash Point - Heating a press by a steam you can expect the internal temperature to reach 400°F. Look for a lubricant that handles well in high heat.
- Will it leave a residue on the product?
- Does this lubrication have additives, to eliminate the build-up of coke?

We did choose a different brand of oil, with a much higher flash point and all the above qualities than what we initially started our trial.

**Lubrication**

| | | Spent | Vol FT3 | $/FT3 |
|---|---|---|---|---|
| Grease | 2014 | $ 1,577,971.00 | 6,329,457 | $ 0.249 |
| Oil | 2015 | $ 1,283,376.00 | 6,069,364 | $ 0.211 |
| | | $ 294,595.00 | | $ 0.038 |

**Cost Savings** $ 229,752.28

The overall 2014 vs 2015 lubrication cost savings was around $229,752 improvement

The next focus was on extending the frequency of scheduled maintenance on the presses. With the assistance of operations a review was conducted on all the press preventative maintenance

plans. Most of these plans were rewritten to focus more on quantitative inspections and less subjective inspections.

Example 1

Example 2

Press Sync Roll Bearing Diagram

Please circle all bearings replaced during downshift then turn this into to planner for data collection/trend analysis.

Flow of veneer

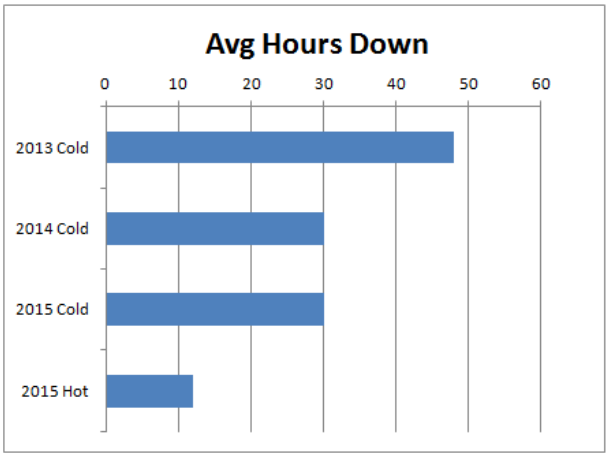
| | |
|---|---|
| P4SR1 | P4SR2 |
| P4SR3 | P4SR4 |
| P4SR5 | P4SR6 |
| P4SR7 | P4SR8 |
| P4SR9 | P4SR10 |
| P4SR11 | P4SR12 |
| P4SR13 | P4SR14 |
| P4SR15 | P4SR16 |
| P4SR17 | P4SR18 |
| P4SR19 | P4SR20 |
| P4SR21 | P4SR22 |
| P4SR23 | P4SR24 |
| P4SR25 | P4SR26 |
| P4SR27 | P4SR28 |
| P4SR29 | P4SR30 |
| P4SR31 | P4SR32 |

Once we tackled the preventative maintenance plans, we were able to speed up our inspection process and our frequency for inspections. We were able to extend the need to perform scheduled maintenance from every five weeks to a six week scheduled. We were also able to take that one step further and alternate the hot and cold scheduled outages.

Through a coordinated effort with department leadership we started having weekly scheduled equipment outage meetings. These meetings focused on specific requests that operations had that were to be addressed during the scheduled outage. The primary focus was along the lines of did it effect safety, did it effect quality of the product we were manufacturing or would it cause extensive downtime in the future. We also focused on timely work identification & review, more efficient work planning, and follow up review once work has been completed.

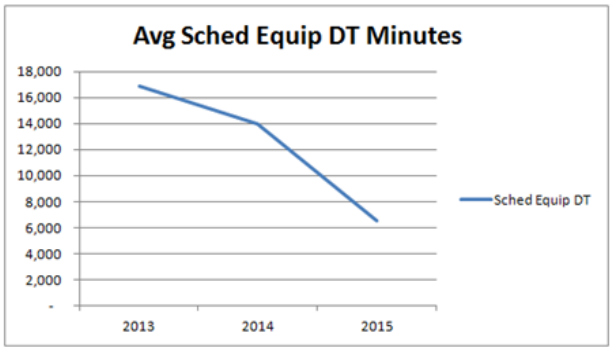
Previously when lubricating our press via grease we were required to shutdown every five weeks for cleaning and maintenance. This outage would range from 36-48 hours per press. (Approximately 420hrs down/press within one calendar year)

With the new schedule of shutting equipment every six weeks, alternating the main internal cleanup to a twelve week cycle and improvements to the preventative maintenance process we have seen a 53% reduction in scheduled equipment downtime from 2014. This is nearly $200,000 of annually downtime improvement cost.




Avg per Department

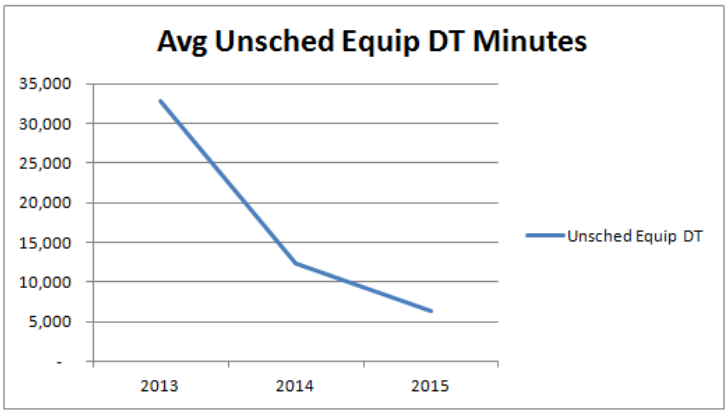
| | 2013 | 2014 | 2015 |
|---|---|---|---|
| Sched Equip DT | 16,866 | 13,973 | 6,535 |




Not only did we see a dramatic improvement in scheduled equipment downtime we also saw improvements in unscheduled equipment as well. There was a 43% reduction in unscheduled equipment downtime from 2014 through end of year 2015.

Avg per Department

| | 2013 | 2014 | 2015 |
|---|---|---|---|
| Unsched Equip DT | 32,766 | 12,280 | 6,300 |




Since starting the iBL course work, efforts have been made to find new ways to predict mean time to failure (MTTF) and mean time to repair (MTTR) within certain areas of the press. When performing routine maintenance on a particular press previously the schedule was to replace the drive chain on the sled every scheduled outage. (Typically five weeks) From past experiences the sled chain rarely made it past the eight week mark which is midway to the next shutdown point. This would cause at least 2-3 hours of downtime and loss of production. A replacement PM was put into place to replace this chain routinely every five weeks.

In an attempt to extend the life and need for replacement of this particular chain a trial of different styles of chain took place. We initially used a 60R chain which only allowed about eight weeks of continuous running. During the second trial we replaced the 60R chain with a 60H. We did see some improvements and extended the replacement life from five weeks to ten weeks. Conducted several conversations with chain manufactures and a suggestion was given to trial a Synergy chain. A plan was developed to trial the chain to determine a failure point. Once a failure point was determined we could develop replacement schedule.

We were able to successfully run the Synergy chain for 24 weeks of continuous use without replacement. Upon the 24th week, we determined that the best course of action would be to set the replacement of this chain to 18 weeks (shutdown schedule is now 6 weeks). This is 3 times the life we were previously getting with the regular chain.

Not only were we able to extend the life of this particular chain, we reduced maintenance labor & costs on shutdowns from replacing the chain 10 times a year to 2-3 times a year. This resulted in a 60% cost savings reduction which is approximately $31,000.

In the early portion of my course work we focused some on ultrasonic acoustic detectors and how this technology could be utilized to detect air leaks. These devices are designed to recognize high frequency "hissing" sounds that are associated with an air leak.

We were able to purchase an ultrasonic devise an ACCUTrak VPX-WR. Within the first 15 minutes of use we were able to easily identify 12 leaks.


We used this detector prior to our annual outage and were able to identify 30+ leaks across our entire facility. From making these corrections we went from constantly running five air compressors to running three compressors. Annual estimated cost savings $64,000 for reduction of air leaks. Savings of 335 CFM capacity day shift and an additional 167 CFM on evening shifts.

We have incorporated ultrasonic's in our routine maintenance to detect the leaks early to prevent any more unnecessary strain on our compressors.

I cannot emphasize enough of how much equipment reliability has benefited our facility over the last 18 months. The proof is defiantly in our numbers, to be able to deliver these amazing results to our company's bottom line and at the end of the day that is what this experience is all about. To be able to utilize the training and knowledge obtained from my iBL experience. I am fairly certain that if my facility wants to continue to improve our equipment reliability we will continue to focus not only on these areas but how else to use this training throughout our facility.

We were able to complete a lot of small project that gave us some big results.  Overall my focus line was able to reduce maintenance cost by approximately $550,000 in one year.