

Starting a new Oil Analysis Program... Burden or Benefit?

Introduction

So...someone in senior management has finally realized the drain on the bottom line of your company caused by reactive maintenance in the plant. Preventative actions have been incorporated into your maintenance strategies but you still are not achieving world-class results. Then you get the call and guess who is in charge of establishing a predictive maintenance program for the plant. After talking with colleagues, industry counterparts, and several “unbiased” vendors, you decide that oil analysis is a tool you want to include in your predictive tool box. No problem. Just look in any lubrication magazine, call the first lad you find advertised, take a few samples, wait on the results and just watch the magic happen. Sure. And next year pigs will fly!!

Basics of a successful OA program

Up Front

There are several considerations that should be taken into account when establishing a new Oil Analysis (OA) program. Getting off to a well defined, credible start can be the foundation for success of a program just as starting on the wrong foot is a guaranteed recipe for failure. No seasoned traveler would embark on a long trip without a reliable, proven navigation device. Neither does a wise predictive maintenance technologist commit to any reliability program without a well-designed, functional, justifiable game plan.

A few considerations to consider:

- ◆ Objectives of the program
- ◆ Expected results
- ◆ Education plan

Identify critical equipment

After justification is in place and the decision has been made to begin an OA program, there are multiple decisions to be made. If expectations from the program have been defined and objectives stated, the next logical step would be to decide which equipment in the plant should be sampled. Some labs make recommendations for sampling based solely on equipment type, reservoir size, and how much money you have to spend. A better approach would be to have a criticality ranking in place for each piece of rotating equipment in the plant. All stakeholders should have a share in determining the criticality of equipment.

Factors that might be considered are:

- ◆ Replacement cost
- ◆ Maintenance history
- ◆ Criticality to production
 1. Will failure result in production loss?
 2. Is the equipment spared?
 3. What is normal turnaround time for rebuilds

What will be sampled

After going through an Asset Management exercise, there should be a clear picture of equipment that should be placed on the program and what should not. It may become apparent that some equipment can be run to failure much less expensive than it would cost to perform regular oil analysis. On machines with smaller reservoirs, if oil quality is all that would be monitored, it may be best to continue with regular or even increased frequency of oil changes. Industrial lubes are expensive but so is oil analysis.

One sample point that is overlooked in a non-mature OA program is new oils. Samples should be taken from each batch of lubes, preferably before the company purchases them. Remember the saying “Garbage in, Garbage out”? It is impossible to achieve quality results with a lubricant that is sub-standard.

After deciding which machines should be sampled, there are two questions that need to be answered.

1. What is being monitored, the machine, the lubricant, or both? Each of these three items required a different set of tests to be able to supply the needed results. At this point, one should also consider the type of machine being monitored. Is it a gearbox, Turbine, Compressor, etc. Each type of machine should have a test package tailored to its needs. This is a good place to begin a dialogue with an OA lab or consultant that is familiar with OA and what can be achieved by using different test packages. More discussion will follow around labs later.
2. How often will samples be taken from each machine? Depending on criticality and type of testing, frequency of sampling could range from one week to one year.

Who will collect samples

Now that it has been determined what equipment will be sampled, how often, and what the test package will be, next in line is the question “Who is going to take the samples”? This may seem like a simple question with a simple answer but how it is answered could have far reaching consequences. While it is important that sample points be located at precise locations on machinery, consistency in taking samples is a must. Having the best sample point in the world will yield unreliable data if samples are taken in an inconsistent manner. When deciding who will be sampling equipment, many options are available. Some of these might be:

1. Plant personnel
 - a. Part time
 - b. Full time
2. Lube vendors
3. Independent lab

4. Contracted company

Who will test the samples

Now that we know which machines are to be sampled, test packages have been established, and someone has been designated to collect samples, the work is about over. Right? Actually the work has just begun. There are several questions yet to be answered. One of which is “Who will test the samples once they have been collected?” There are several options that can be employed for this stage of an OA program.

1. The first and often the obvious option is to have an on-site lab to process all oil samples collected. There are many pros to this option. Turnaround time for results can be controlled in house. There is no dependence on an outside resource. Testing packages can be altered easily, etc. However there are also cons to this option. Expensive equipment must be purchased and maintained. Testing supplies must be inventoried and purchased on a routine basis. Lab technicians must be trained for each test procedure. At least one lab analyst must be trained to interpret test results. This alone requires a technical skill that often takes years to acquire and refine.
2. Another option for testing samples would be to bargain with the lube vendor supplying the plant. Who knows better what is in the oil and what it should look like – especially if there are any formulation changes? Often lube suppliers will offer to perform oil analysis for “free” if the company will purchase all their lubes from said company. It has been said that letting the vendor make all the decisions around oil analysis is like “Letting the fox guard the henhouse”. One must consider if it is better to pay extra for an OA program or turn the program over to a vendor and then have limited control on most decisions. Remember, lube manufacturers are in business to sell lubes, not oil analysis. Also remember that the supplier has little to gain by offering poor results. If we tell you it’s good and your machine fails, it will be on our head. If we tell you the oil is bad so you’ll change it and you find out otherwise, you will completely use trust in us.
3. The third option might be to contract with an outside lab to test collected oil samples. The pros and cons of this option, in many cases, are almost opposite of those listed in option one. Also, one must realize that there are many OA labs in business and almost each one has its own idea of how oil analysis testing should be performed. Sure, there are standard ASTM tests that all labs follow. How those tests are used in unison can make a drastic difference in the success of an OA program. For instance not all equipment needs a particle count. Each sample does not need to have a ferrographic slide made. Each test performed on an oil sample costs money. This is another reason to make sure that you choose the correct oil analysis provider.

Choosing the correct Oil Analysis provider

If it is determined that contracting an outside lab is the best course for your OA program, care must be taken to insure that the lab is a good fit for your company. As previously stated, there are as many different approaches to OA as there are types of cars. This is not saying that any one approach is better or worse than another. It simply means that it is important to match a lab with the predictive maintenance strategies that your plant employs.

It should also be understood that many labs serve specialty industries. Some cater to the commercial industry while others are primarily power, petrochemical, etc. While a particular lab

may not specialize in the industry you work in, if you give them a call they will still agree to perform your testing for you. The question that must be answered is “will I receive the correct tests and does the lab have the experience required to be my OA provider?”

There are several other considerations that must be taken into account. Some of them might be:

- ◆ What is turnaround time on samples?
- ◆ What does pricing include? Shipping cost/site visits from lab/training/rush samples/sampling/supplies/lube audits/etc.?
- ◆ Will technical help be available? Does it cost extra?
- ◆ How long will the contract last? What would it cost to “drop” the contract?
- ◆ Report distribution

Interpreting the reports

If a lab is contracted to test samples, it is normally part of the package that the lab will provide an experienced analyst to interpret data on each report and make recommendations. However, it is important to remember that this analyst could possibly see many thousand reports each day, depending on the size of the lab. It is always best to have someone on-site to reevaluate each report that is not rated as being normal. If an on-site analyst only evaluates non-normal reports, a huge amount of time should not be required. Also, bear in mind that an experienced plant employee will be able to pick up on a declining trend on a report much faster than someone who is not familiar with the equipment.

If an on-site analyst is incorporated into the OA strategy, it is also of the utmost importance that proper training be provided to this person. A position requiring judgment calls without proper training is sure to spell disaster sooner or later.

How will results be communicated

Simply sending samples to a lab for the sake of owning data would not define a very good OA program. Once a sample is tested and the data is in place there must be a way to communicate that data to the right people. The best place for the lab to communicate this data is to an on-site analyst. The analyst in turn communicates to internal plant customers. There are several ways for a lab to communicate with the analyst. Some of the choices might be:

- ◆ Telephone
- ◆ Fax
- ◆ E-mail
- ◆ Internet web site
- ◆ Mail

It must be determined during the planning and negotiating stages with a lab how data/reports will be communicated. It should also be determined how critical or rush sample reports will be communicated. Just by the nature of the different choices for communication of these reports, it should be pre-determined how fast sample results should be returned to the plant. If a sample is only collected on a quarterly basis, is it really necessary to have the test results overnight? It is often better not to require test results so quickly that it would rush the lab. This could be a substantial cost savings. Turnaround time on “rush” samples, however, should be considered and incorporated into the contract with the lab.

Once the plant analyst receives reports from the lab, it is needful that those reports be communicated with plant personnel. Some of the positions that would benefit from seeing report results might be:

- ◆ Maintenance
- ◆ Management
- ◆ Engineering
- ◆ Operations
- ◆ Other predictive technology groups
- ◆ Lubricators

Trending is the key

How the internal communication takes place varies from plant to plant and industry to industry. There is always a best-fit for each plant or industry.

Issuing and managing maintenance actions

Once samples are collected, data is compiled, reports are generated and distributed, what happens then? Someone must make the call on maintenance items such as oil changes, filter changes, dehydration needs, etc. The plant OA analyst normally handles this. It is important that these requests be issues to the proper people and tracked to completion. This insures that equipment with a bad track record can be identified and proper root cause action taken.

Who will pay the bills

Next in line is the ever-present question of who is going to pay for this program. If the decision is that the company will own and pay for the program, it must be determined where the money will come from. Will this be an item for the maintenance budget? Will all departments be charged for samples collected in their respective areas? Who is going to monitor the payment process?

Justification

One process that must be considered in any predictive maintenance technology is how the program will be justified. In oil analysis it is easy to fall into a pitfall and go from the company hero to searching for a job in just a few years. One common way of justifying OA is keeping records of all predictive oil changes, filtration request, dehydration request, etc. Each maintenance item is assigned a benefit dollar amount. In a young program the cost savings start building very rapidly. Reservoirs are normally dirty, filters are clogged, and water is present in many cases. This sets the stage for huge bragging rights. But what happens when the OA program starts achieving its long-term goals? Reservoirs get cleaner, filters last longer, and water in systems becomes present less and less. There go the bragging rights. The cost savings suddenly drop substantially. It is hard to go back to management and cause them to understand that what was once good is now bad. According to previous calculations, the more maintenance items from OA, the better. Now it looks like less is better. It may be best to calculate cost savings directly from equipment reliability from the inception of the program.

Before starting an oil analysis program one should stop and ask several questions. The primary question should be “do we really need an oil analysis program”? To answer yes, justifications measures should be in place. A few of the questions that need to be answered to justify a new OA program are:

1. What am I doing now?

- ◆ Are there any pro-active measures in place around lubrication? Are they working? If so, what results are being achieved?
 - ◆ What measures need to be activated to ensure the plant has a world class OA program?
2. What can I learn from OA?
- ◆ What will sample reports show me? Many times, failure of a new program is almost certain because expectations are too high! It is important that capabilities of a good OA lab and reporting system be well understood up front.
 - ◆ What will sample reports not show me? OA is simply a tool that fits nicely in most predictive maintenance tool chests. Just as each wrench in a tool set was designed to work for one specific task, fastener, etc. OA cannot take the place of other predictive technologies.

Answering these question should help to establish clearly defined objectives for the program. Remember, “Where there I no vision, people perish”. This also holds true for Oil Analysis.

Management Considerations

Probably one of the most essential elements to any successful OA program is credibility. We all know that credibility doesn't come cheap. Once credibility in a program is established, it must be maintained. Any knowledgeable predictive maintenance person will agree that how internal customers view the program can determine if the program is a hero or a zero. There are two sides to establishing credibility in any OA program.

1. One side of credibility in any OA program is somewhat political. How does management, operations, maintenance, etc. view the program? Is OA being forced on them just because it is part of the current maintenance strategy? One of the best ways to avoid this phenomenon is education. The necessary education of what OA is and is not should be tailored to each level within the company that it is presented to.
2. Having personnel in the OA program that can communicate properly is of utmost importance. When someone asks a question concerning his OA program, he needs and deserves a frank, understandable, truthful answer. Acronyms such as PC, FTIR, VIS, TAN, etc. are foreign terminology to most people outside the oil analysis realm. Most managers don't have time to listen to a lesson in OA. They just want to know if their oil is good and if their equipment is going to fail or be reliable until the next sample frequency. Nothing could be more frustrating than listening to a 15 minute rambling about how wonderful OA is and how it is going t solve every problem that maintenance has ever seen and then walking away and wondering what was really said. What would suffice best, telling your manager that “the PC is 21/19/16 and the VIS has raised 20%” or simply stating, “foreign particles have passed recommendations and oxidation has caused the viscosity of the oil to raise past a safe level for this machine”?
3. The second part to credibility is in the program itself. Does the program really add value to the company? When was the last time it did? Benefits must be ongoing. If a manager goes for a space of time and sees no value from OA, what happens to his trust in the program? The other side to this coin is “can every maintenance action requested from OA results be backed up with data?”

While it is a given that the program must stand on its own merit, also critical to success, the manager of the program must have merit of being knowledgeable, truthful, and easy to work with. Without this, the program manager is no more than an outside consultant trying to sell a solution to a problem that may or may not exist.

Training

One aspect of a reputable, self-sufficient OA program that is often overlooked is training. Oil Analysis is an ever-changing technology and to reap all the benefits, one must continually receive quality training. The level of training each person involved with OA receives should be determined. Samplers may not need the same level of training as the plant analyst. Classes and/or certifications should be identified. Department budget should reflect these educational opportunities from year to year. Trade shows and conferences are another way to help OA personnel stay on top of recent advances in their field.

Conclusion

Just sending an oil sample to the first lab found in a magazine may not guarantee a quality OA program. Simply taking a few precautionary, well-planned steps should minimize any unforeseen problems. With a good vision, correct communication, and an understanding of what to expect from Oil analysis, a program can be established that will be credible and a merit to the reliability of any company.