



# How a Properly Designed and Managed Lubrication Program Supports the Operational Excellence of a Food & Beverage Manufacturing Facility

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## OVERVIEW

Equipment maintenance culture and practices have changed over the last several years perhaps more than any other industrial management discipline. This change is due to an increase in the number and variety of physical assets, the development of technology, and the emergence of new maintenance techniques.

The food processing industry, which includes the entire growth and development cycle of crops—from the processing of seeds, grains, poultry, and vegetables for different types of food and related industries, to the production of finished packaged food and beverage products, is no stranger to this trend.

A reliability-centered maintenance strategy benefits the reliability, dependability, and longevity of machinery at all stages of the food supply chain. One often overlooked item in a reliability-centered maintenance strategy is reliability-centered lubrication.

To achieve optimal results from a reliability-centered maintenance strategy, reliability-centered lubrication requires a different mindset. The old school, low-qualified technicians with minimum technical work done on the lubrication design, planning, and execution are gone. Now, lubrication precision, high-quality training, and better lubricant application technologies are enhancing the performance expectations of manufacturing, filling, and packaging production lines.

That said, traditional thinking that assumes lubrication is not as valuable as other maintenance and reliability strategies persists despite that fact that poor lubrication practices may result in significant corrective maintenance and operational costs that are accrued over time.

Previously, no one looked at the lubrication function from a real cost perspective with regards to dated or incorrect practices associated with lubricant selection and purchase, lubricant physical management, lubrication tasks, and machine condition monitoring through a lubricant analysis lens.

Many leaders are still unaware of the impact that these unnecessary and unforeseen costs can have on their operational budget. Neither are they aware of the benefits they could derive from implementing an optimized reliability strategy, and particularly a reliability-centered lubrication strategy.

This white paper attempts to shed light on the importance of properly designing and managing an effective lubrication program.



## THE VALUE OF A RELIABILITY-CENTERED LUBRICATION PROGRAM

The following set of questions and answers will aid in understanding the true value of a reliability-centered lubrication program.

### **Question #1 - Why isn't the heavy burden of poor lubrication seen at its total and correct extent?**

There is an incorrect belief that lubrication failures happen only when the machine runs without lubricant, or a completely different lubricant was put in the machine, producing a noisy or catastrophic issue. These failures are just a small portion of all lubrication-related mishaps.

To truly understand the total cost of lubrication-related machine failures, one must understand that most failures are silent and happen slowly with minimum or no clear signals. This is because one or more of the parameters below have not been optimized.

Selection of the right lubricant for the specific machine component's operational parameters and environmental context.

Application of the right amount and frequency to renew the lubricant when needed.

The use of a pure lubricant free of any contaminant, fluid, or substance that alters its physical-chemical balance. In food processing plants, potential contaminants include produced product, heat, water from washing activities or the environment, and chemicals or other compounds coming from the process itself.

Running the lubricant with minimum/controlled (microscopic) solid particles to avoid progressive machine wear.

To achieve the desired lubrication results, it is necessary to have a holistic approach, whereby all contributing factors are considered and working with precision. This produces dependable and long-term machine operation.

Also, consider that:

When operating in a progressive lubrication failure mode, machines continue running but age at a faster pace. Failure impact is diluted along the hundreds or thousands of hours of machine operation.

Lubrication-related failures can be hidden behind other failure modes, i.e., with another type of failure happening at the same time. When a misalignment, unbalance, or abuse of operation happens, the failure worsens if the lubricant condition is not optimal. The failure mode detected may not see a lubrication failure.

This hidden cost may be many times the cost of lubricant and lubricant application, whereas the necessary investment to change poor practices can have amazingly high return rates.

## **Question #2 - How can best practices be implemented for a food and beverage industry?**

The following are some critical practices to implement:

### **Focus on precision**

Begin by defining the reliability goals of machines and extracting from there the contributions of lubrication excellence. Precision lubrication requires precision tasks constructed according to industry best practices.

### **Holistic thinking**

Lubrication is not an isolated activity of putting some oil or grease into a machine or component. It requires a holistic vision of all factors that affect the lubrication function, including:

- Proper technical analysis for the selection of lubricants – this impacts the selection of food-grade (FG) lubricants in places of food contamination risk. Conducting an HACCP (Hazard Analysis and Critical Control Point) provides useful information to determine the areas or machines that require FG lubrication products
- The lubrication methods and lubricant management technologies
- Strict lubricant contamination control
- Implementation of lubricant and machine condition monitoring methods
- Optimized procedures supported by qualified training
- Proper safety and ergonomics taken into consideration for all activities
- A long-term vision – the best results of a reliability-centered project are achieved in the mid and long term, not in a few months or even within a year because all factors affecting the reliability function must be defined, implemented, monitored, and integrated to work as a whole system

### **Resources**

A successful lubrication program must have enough resources to support it and to ensure the change is executed across the organization. This includes making an

investment in awareness and training, effective communications, quality hardware for lubricant management (storage, handling, application, and monitoring), a solid database and software (CMMS) to manage the detailed and precise information required by the program, adequate time for implementation, and finally metrics and accountability to track work progress and completion.

### Cultural alignment

How can a group of people work together with a common purpose, if an organizational vision is not established, an effective communication plan is not in place, and the involvement of everyone is not allowed? Cultural alignment means that all the teams share the same vision and can contribute to make it happen.

### Question # 3 – How can a reliability-centered lubrication (RCL) program be implemented?

Following is a summary of actions to take. Note that the program may vary depending on the facility's complexity and maturity of the current maintenance program.

- ✓ Define equipment criticality and conduct risk analysis (HACCP) – also consider compliance with ISO 22000\* to identify the appropriate maintenance plans according to criticality and risk
- ✓ Create/update a Lubrication Survey – this is a core document that supports implementation of the industry's best practices. It involves the development of a verified list of assets that have lubricated components, with detailed information on lubricants, frequencies, amounts, applicable procedures, required training, and condition monitoring.
- ✓ Create General Lubrication Guidelines for the RCL program – this is the operating document that outlines the purpose of the lubrication program and sets the stage for its importance. It provides the parameters and scope of the RCL program, including the equipment criticality and risk, as well as selection and use of FG lubricants (NSF H1 or ISO 21469)\* for food processing machines.
- ✓ Select the right lubricants – having the right product properties and performance is key for a long machine life. Performance is defined by the lubricant viscosity and formulation. This includes, among other critical factors, the selection of FG

lubrication products required in areas or machines where there is potential exposure of the processed product or its package to the lubricated component and lubricant.

- ✓ Enhance contamination control practices for lubricants – the lubricants in service should be reasonably free from contaminants, including mixtures with other lubricants. Define/validate filter specifications and decontamination systems, acquire filtration/decontamination units, modify machines for reliability, implement best lubricant management practices.
- ✓ Create standard lubrication and inspection-related procedures – a detailed, written, and communicated procedure should be in place for every relevant task executed with regards to the lubricant management cycle and lubrication functions to achieve precision and consistency of the executed work.
- ✓ Redesign the Machine Condition Monitoring program, including an Oil Analysis program – the purpose of a world-class lubricant analysis program is to maximize the detection of potential root causes of failure, of both the lubricant and machine. Most lubricant analysis programs are underused due to the maintenance team's lack of technical expertise.
- ✓ Provide all necessary training to the maintenance and reliability teams – training in RCL awareness, advanced machinery lubrication, and oil condition monitoring is required to design, implement, and maintain an effective RCL program.
- ✓ Develop metrics and establish continuous improvement – monitoring the RCL program implementation and improvements to machine reliability are critical to justify the program, to demonstrate its benefits to the organization, and to provide feedback for continuous improvement. Review the program's effectiveness periodically and determine opportunities for further improvement.

### Question #4 – Why is the RCL program part of an Operational Excellence project?

As previously mentioned, upper management generally deals with financial numbers, and almost everything in the organization is seen from an ROI perspective. As reliability professionals, it is our responsibility to demonstrate to the plant manager, chief financial officer, and company

president the tremendous opportunities that can be garnered when investing in plant reliability, while realizing a high return on investment (ROI) by reducing operational costs.

The Shingo Model Prize for Operational Excellence (Jon M. Huntsman School of Business) is a valuable reference to ensure success of your RCL program. The main tenets are:

### Respect everyone

Just as everyone has worth and potential, lubrication deserves respect. Lubrication excellence is not a dirty and low-skilled function. Conversely, excellence in lubrication requires deep knowledge of technologies, use of modern work methods, technical training, and qualification.

### Exercise humility

Leaders should always exercise humility. Many times, good improvements are the result of accepting something was not done properly. Lubrication is not an exception; there are still diverse industries where lubrication is behind several other disciplines. Fortunately, the food and beverage culture is changing.

### Seek perfection

This is often met with resistance, as many people are quick to point out that perfection is not possible. A good practice is to continually strive for excellence, which is close to perfection, but from a more realistic standpoint.

### Scientific thinking: experiment and learn

It is important to stimulate new ideas and new ways to work. That is a great remedy to traditional thinking. Leave the dirty lube room in the past. Thinking in a different way is an exercise for all in the organization.

### Focus on the process

Focus on the processes and facts, not on the people and their perceptions. Good results cannot be achieved with inadequate processes. High machine reliability cannot be achieved if poor/deficient maintenance practices are followed. When mistakes occur, it is better to assess the process and the failure point than someone's behaviors.

### Assure quality at the source

High quality can only be achieved once every element of the process is done correctly. High machine reliability can

be achieved only when precision maintenance, and specifically precision lubrication, is implemented in all processes.

### Flow and pull value

The purpose of an organization is to produce value. Therefore, the workflow should be continuous without the interruptions that create waste and inefficiencies. An RCL program cannot flow effectively if there are deficiencies in the maintenance databases/software, existing procedures, training, and availability of quality tools.

### Think systematically

In a system, the interconnected parts work together. It is necessary to understand the relationship between each of them, since it will help to make better decisions. Lubrication excellence requires a holistic mindset to see the interconnections among the lubrication functions and the lubricant management, purchase process, human resources development, and capital investment. Such a vision will certainly provide the necessary resources to implement excellence.

### Create consistency of purpose

Employees should be informed of the goals and mission statement of the reliability initiative, starting on Day 1 of the project. Then, continue to emphasize these goals and principles each day going forward. Every involved member of maintenance, purchasing, warehouse, engineering, and operations should have an understanding of where the organization is headed. This will help them align their own actions and goals with those of the company.

### Create value for the customer

To create value for the customer, it is necessary to understand their needs. The value is just what that person/organization is willing to pay for. Reliability-centered lubrication creates value by increasing uptime, reducing machine shutdowns, and extending machine longevity. It helps to offer a product to the customer that will be provided at a competitive price (and operational cost), in a timely manner, with continuous processes/workflow.

## CONCLUSION

An RCL program implemented with focus and discipline will be a valuable ingredient for the success of the Operational Excellence project of the organization. Operational excellence starts with the right mindset. RCL starts with a comprehensive understanding of its value to the organization, as well as a systemic perspective that allows creating the necessary changes in all the system elements.

## REFERENCES

The Shingo Model Prize for Operational Excellence /Jon M. Huntsman School of Business

Certification ISO 21469 “Safety of machinery — Lubricants with incidental product contact — Hygiene requirements”

ISO 22000 “Food Safety Management”

National Sanitation Foundation- [www.nsf.org](http://www.nsf.org) – link: <https://www.nsf.org/testing/food/food-equipment-appliances/nonfood-compounds-chemical-registration>

### \*NOTES:

H1 – These lubricants are products registered with the NSF (National Sanitation Foundation), which contain non-toxic ingredients. H1 products are intended for incidental contact with food. It is advised that no more than 10 PPM of contamination must be permitted in the food.

Certification ISO 21469 “Safety of machinery — Lubricants with incidental product contact — Hygiene requirements” is a certification that verifies the lubricant is made of non-toxic ingredients, plus a certification that the production and handling processes are safe.

ISO 22000 “Food Safety Management” provides guidelines to manage the safety of products for the well-being of consumers. See video at <https://www.iso.org/iso-22000-food-safety-management.html>