

# Des-Case Confidential Report

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## Reliability Services Lubrication Assessment Report

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Project Name: Reliability Services Lubrication Benchmark Assessment

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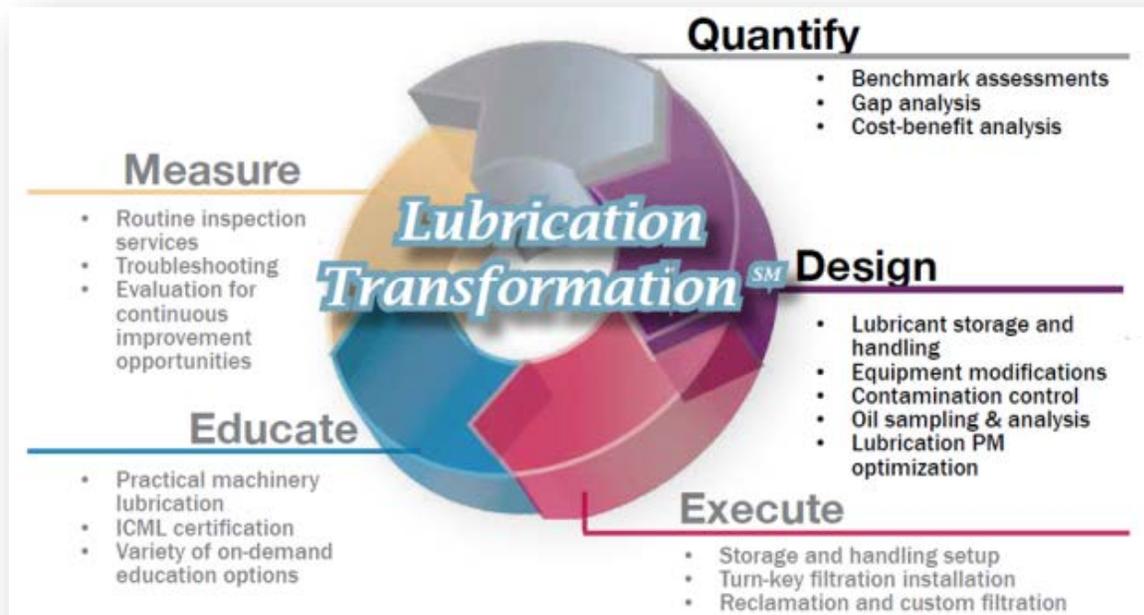
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## Introduction

Des-Case's Reliability Services are designed to not only show you the path from where you are to where you want to be, they can give you the tools to get it done. The process can start in any one of five distinct areas:



Des-Case products and services are designed to help companies achieve a new level of performance in maintenance and reliability. Combining unique services, a wide array of products, and solid support, Des-Case can help increase uptime, reduce costs, and gain greater efficiencies for your equipment.

Most people recognize that precision is an important part of a reliability driven maintenance program, but often struggle with how and where to start implementing changes. Des-Case's Reliability Services are designed to help companies develop and deploy an executable plan to help them get to the next level. In conjunction with an array of products, the transformation process can help you quickly identify the steps you need to take, help your team learn practical machinery lubrication, and perform cost-benefit analysis to help you in your implementation.

Getting clean, dry oil into machines (and keeping it that way) is one of the most fundamental elements of precision lubrication. Des-Case's lines of desiccant breathers, lubricant storage systems and oil transfer and filtration systems help mills meet or exceed the stringent contamination control targets necessary to achieve improved machine reliability and production uptime.

Filtration devices should be used to remove particles and water, further extending and preserving the working life of the oil. They are not just a tool for emergency remedial measures when dealing with contaminated lubricants and hydraulic fluids, but are an integral component of

proactive maintenance. Des- Case provides a wide array of customizable, quality filtration units, from small, portable devices to full-featured storage and vacuum dehydration systems.

Now, implementing lubrication best practices – including maintaining clean, dry lubricants—and gaining the profitability that goes with it, is easier than ever. Des-Case's Reliability Services team is committed to helping with guidance on where to go, and provide the tools to get you there.

## Overview

This document provides the results of the Des-Case Lubrication site assessment recently completed. This report details your benchmark score in each of the ten key areas of lubrication relative to world-class, identifies what best-in-class lubrication practices look like in each category and provides a project plan and action item list to help the mill start to close the gaps between current and preferred state. The report is organized into three sections as follows:

### 1) Benchmark Assessment

Our responses to the 50-question benchmark assessment survey are rolled up to provide an evaluation of the facility's current lubrication practices in each of the ten (10) dimensions of precision lubrication. For each dimension, the facility is ranked on a scale of 0-10, with 10 representing textbook world class. The intent of the benchmark is to provide a starting baseline by which future improvements can be gauged. As part of the Lubrication Transformation process, it is recommended that the facility complete the same assessment using our online survey tools every 6-12 months to plot progress toward the facility's stated goals.

### 2) Best Practices Recommendations

For each of the ten-categories evaluated in the benchmark survey, a general discussion of what the preferred practice should be is provided. Also included are category specific recommendations intended to help explain how to get from current practice in the facility to something considered best-in-class.

### 3) Project Improvement Plan

Based on the gaps identified in the benchmark evaluation, a detailed action item list is provided which addresses all opportunities. It is intended that this list serve as a project plan to guide the facility in implementing the recommendations provided. This list should be carefully reviewed with a Des-Case Technical Services Project Manager in order to develop a prioritized list of action items and initiatives.

## **Disclaimer**

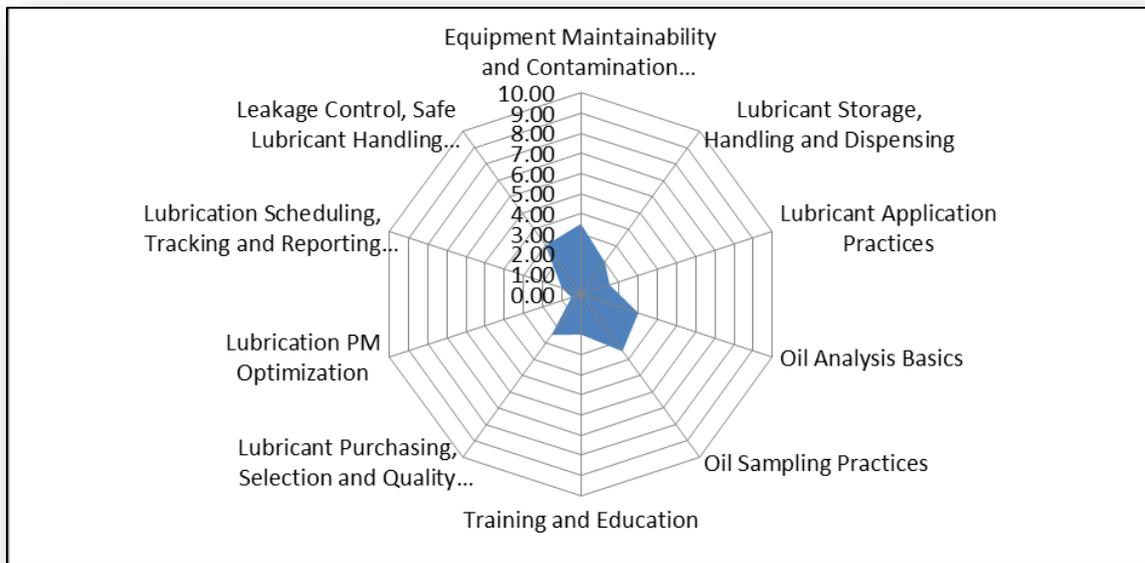
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## Benchmark Scoring Summary

The following table provides a benchmark score for each assessed component of the mill's current lubrication practices. The ranking is on a scale of 0-10. A score of 8 or better is a good target to shoot for, while a score of 3.5 or less indicates substantial weakness. The report contains specific details regarding each dimension of lubrication best practices, including targeted recommendations and action items to address any deficiencies identified.

Category	Composite Score (0-10)
<b>Equipment Maintainability and Contamination Control</b>	3.50
<b>Lubricant Storage, Handling and Dispensing</b>	2.00
<b>Lubricant Application Practices</b>	1.50
<b>Oil Analysis Basics</b>	3.00
<b>Oil Sampling Practices</b>	3.50
<b>Training and Education</b>	2.00
<b>Lubricant Purchasing, Selection and Quality Assurance</b>	2.50
<b>Lubrication PM Optimization</b>	0.50
<b>Lubrication Scheduling, Tracking and Reporting Metrics</b>	1.00
<b>Leakage Control, Safe Lubricant Handling Practices and Environmental Compliance</b>	3.00
<b>Average Score</b>	2.25
<b>Lubrication Grade</b>	F

A graphical representation of the mill's performance is provided in the spider chart below. The dark-shaded area represents the current performance, while a score above 8 represents the recommended target for each item.



Although much of the equipment in the mill is indoors and/or under cover, the environment inside is often harsh with respect to moisture and heat and may make lubrication best practice challenging in many areas. Also, the equipment found outside requires additional consideration with regard to lubrication based on its exposure to the elements. Much of the equipment suffers the effects of high levels of water contamination and solid particle contamination due to a virtually non-existent approach to contamination control. Perhaps the greatest threat to the success of your lubrication program is the use of incorrect lubricants in many of the components. Overall the mill received low scores in most areas. This, of course, should be viewed as an opportunity.

Currently, the greatest strength of the program is the direction and management from Matt Boobar and his team and the general acceptance from management that improvement is necessary. Perhaps the most significant potential benefit we can expect from a lubrication program exists within the PM program itself. It is widely accepted that most PM's are in need of optimization and that as many as 50% of PM's add no value. Evidence of execution of non-value added tasks was widely apparent within the mill. The opportunity to reduce unnecessary labor and redirect to value added tasks is significant.

There are many weaknesses in most areas of the lubrication program which range in severity. Specific recommendations in these and all other areas will be addressed in the following pages. There are weaknesses in most areas of the lubrication program which range in severity. The most threatening are the storage and handling practices for most areas. Contamination Control, which includes storage and handling, should be a primary concern.

## Category Specific Recommendations

### Equipment Maintainability and Contamination Control – Benchmark Score 3.5

Equipment Maintainability and Contamination Control refers to how facility equipment is equipped for controlling contaminants within a system and condition monitoring for determining when routine tasks should be performed.

*This section of an assessment report contains photos taken during the equipment walk down including specific recommendations on how to close the gaps between current practices and preferred lubrication practices.*

*Confidentiality prohibits us from showing specific examples. Contact Des-Case for further information*

## Lubricant Storage, Handling and Dispensing – Benchmark Score 2.0

The Lubricant Storage, Handling and Dispensing category reviews not only the current storage area, but also general practices utilized for moving lubricants throughout the facility. This includes how lubricants are received, stored, and transferred from storage to transfer containers to oil lubricated components.

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## Lubricant Application Practices – Benchmark Score 1.5

Lubricant Application Practices refer to how facility equipment is equipped for performing lubrication related application tasks for the purpose of minimizing contamination risks as well as ease the labor burden associated with performing these tasks.

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## Oil Analysis Basics – Benchmark Score 3.0

The Oil Analysis Basics category reviews the general approach to the oil analysis program. This includes an evaluation of current test protocols (test slates and flagging), test data evaluation, and laboratory quality programs.

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## Oil Sampling Practices – Benchmark Score 3.5

Oil Sample collection techniques can have a dramatic effective to the test results and subsequent data interpretation. The portion of the assessment looks at sample methods, procedures, and sample collection equipment.

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## Training and Education – Benchmark Score 2.0

Lubrication personnel can be the greatest asset to a lubrication program, but it requires proper training and education to ensure best practice methodologies are utilized.

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## Lubricant Purchasing, Selection and Quality Assurance – Benchmark Score 2.5

Lubricants are the core to any lubrication program. If lubricants are not properly specified from the start, there is no amount of equipment modification, filtration, etc. that can be performed to increase the life of a component or its lubricant. Currently stocked lubricants are evaluated on what manufacturer and products are available, quantities stocked, and overall number of products. Additionally, the methodology used for selection will be taken into account.

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## Lubrication PM Optimization – Benchmark Score 0.5

Lubrication PMs encapsulate routine tasks such as re-grease, oil level top up, filter changes, oil changes, etc. However, many time tasks and prescribed intervals occur too frequently or not often enough. This section reviews current practices and potential opportunities to optimize tasks through the use of engineered calculations and condition based monitoring.

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## Lubrication Scheduling, Tracking and Reporting Metrics – Benchmark Score 1.0

Work order tracking is typically monitored for Maintenance PMs and Work Orders, the section refers to how lubrication specific PMs and Work Orders are monitored. As well as, metrics associated with them and oil analysis results.

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## Leakage Control, Safe Lubricant Handling Practices and Environmental Compliance – Benchmark Score 3.0

Leakage not only causes excessive oil consumption but can also cause safety issues or environmental non-compliance. This section identifies any issues found relating to oil leakage, lubricant safety and environmental compliance.

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## Cost Benefit Analysis

Based on estimates and data from other paper and tissue mills, a conservative assessment of the financial impact of lubrication has been provided. This CBA is based on discounted cash flow analysis to value the project using the concepts of the time value of money. Because we know that the value of a dollar is worth more today than at any point in the future. Here, all future cash flows are estimated and discounted to give their present values. We end up with the value of the return in today's dollars.

		Low Case Estimate	Likely Case Estimate	High Case Estimate
<b>Question 1</b>	How much do you typically spend annually on ALL maintenance work (mechanical, electrical etc.)? Include in your estimate both material and labor costs for both planned (scheduled) and unplanned (repair) work.	\$9,000,000	\$9,000,000	\$10,000,000
<b>Question 2</b>	In a typical year, how much do you lose due to unscheduled downtime, production slowdowns or off spec production? If you cannot provide an reasonable estimate, enter \$0 and proceed to complete the assessment without accounting for production losses.	\$0	\$0	\$0
<b>Question 3</b>	Of your total annual maintenance costs entered in question 1, what percentage can be attributed to either scheduled rebuild/replacement or emergent, unscheduled repairs? Exclude any costs associated with routine inspections or routine predictive maintenance activities.	80%	80%	80%
<b>Question 4</b>	What percentage of scheduled or unscheduled repair work is performed on rotating or reciprocating equipment, as opposed to facilities maintenance, electrical equipment etc.?	50%	50%	60%
<b>Question 5</b>	Of the scheduled or unscheduled repair tasks performed on rotating or reciprocating equipment (Question 4), in your estimation, what percentage are due to poor lubrication (wrong lubricant, under or over lubrication, contaminated oil etc.)?	10%	25%	50%
<b>Question 6</b>	By implementing the improvement plan outlined in this project proposal, what percentage of the lubrication problems entered in question 5 could have been avoided?	75%	75%	70%

	<b>Response</b>	<b>Calculated value</b>
Choose low, medium or high case estimate	low case	
Annual maintenance costs	\$9,000,000	\$9,000,000
Scheduled PM and Repair costs	80%	\$7,200,000
Amount spent on rotating/reciprocating equipment	50%	\$3,600,000
Percentage of lubrication related problems	25%	\$900,000
Percentage of lubrication problems that can be eliminated	75%	\$675,000
<b>Estimated Annual Losses Due to Poor Lubrication</b>	<b>low case</b>	<b>\$900,000</b>
<b>Addressable Losses Due to Poor Lubrication</b>	<b>low case</b>	<b>\$675,000</b>

<b>Business Case Analysis</b>	
Prepared for	ACME Paper Co.
Location	Anywhere, TN
Client Contact	Joe Smith
Des Case Account Manager	Jason Kopschinsky
Distribution Partner	Better Products Inc.
Distribution Partner Representative	John White
Assessment Date	6/29/2015

Financial Evaluation Case	low case
Estimated Annual Lubrication Losses	\$900,000
Addressable Annual Lubrication Losses	\$675,000

Year	0	1	2	3	4	5
<b>Program Benefits</b>	\$0	\$675,000	\$675,000	\$675,000	\$675,000	\$675,000
<b>Program Costs</b>						
<b>Upfront</b>						
Lubrication Training Program	\$9,750					
Lubrication Audit (inc. modification design for maintainability)	\$120,000					
Lubrication Audit Implementation	\$95,000					
Lube Room Design	\$105,000					
Oil Analysis Design	\$15,000					
<b>Ongoing</b>						
Lubrication Training Program		\$9,750	\$9,750	\$9,750	\$9,750	\$9,750
Lubrication Audit Implementation (consumables)		\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
Lube Room Consumables		\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
Oil Analysis		\$30,000	\$30,000	\$30,000	\$30,000	\$30,000
<b>Total Costs</b>	\$344,750	\$59,750	\$59,750	\$59,750	\$59,750	\$59,750
<b>Net Cash Flow</b>	-\$344,750	\$615,250	\$615,250	\$615,250	\$615,250	\$615,250
<b>Select Discount Rate</b>	15%					
<b>Discount Factor</b>	100%	87%	76%	66%	57%	50%
<b>Discounted Net Cash Flow</b>	-\$344,750	\$535,000	\$465,217	\$404,537	\$351,771	\$305,888

<b>Investment Analysis</b>	
Five Year Net Present Value (NPV)	\$1,717,663
Internal Rate of Return (IRR)	177%

## Action Item List

A list of action items has been prepared based on opportunities identified from the benchmark assessment. The action item list has been included as a separate Excel working document. Completion of tasks listed in this document should help achieve best-in-class in all the areas of precision lubrication. The action item list which is attached as an Excel file should be a living project management tool to help track completion of items based on their priority ranking and the mills ability to fund and close the gaps identified.

## The Next Steps

The most important part of your lubrication program at this point is following through on your commitment to make a change. Des-Case is now part of your Lubrication Improvement team and will guide you through the process helping and supporting you along the way. So that you are successful in your lubrication transformation improvement program, Des-Case will assume the role of project manager to help keep your plan on track.

The team is made up of all partners with a hand in lubrication in your facility. The project team may include your lubricant supplier, your local Des-Case Strategic Partner, your oil analysis lab and a site champion, and the project is coordinated using Des-Case resources. For example, if your facility required a design and hardware for a lube room, Des-Case would work with our local distribution network to make sure you get what you need from design, to sales of products, to installation and beyond. Same goes for PM optimization or a lube survey. Des-Case would work with your lubricant supplier to make sure the ideal products are being used, inventory levels are adequate and lube PM's are rationalized. And the same process is used for all other actionable items in your plan.

