

Gleason Phoenix 450 Project



February 2008 – July 2010



Dana Snapshot

- ▶ Founded in 1904
- ▶ Based in Maumee, Ohio
- ▶ 2009 sales: \$5.2 billion
- ▶ 21,000 employees*
- ▶ 96 major facilities in 26 countries*

* As of 3/31/10



Business Overview

Diverse Markets

@ March 31, 2010

Automotive

Passenger cars and light trucks, including pick-up trucks, sport utility vehicles (SUVs), vans, and crossover utility vehicles (CUVs).



63% of Sales*

Commercial Vehicle

Medium- and heavy-duty trucks, buses, and other commercial vehicles.



20% of Sales

Off-Highway

Agricultural and construction machinery; mining, forestry, material handling and outdoor power equipment; as well as non-vehicular, industrial applications.



17% of Sales

DANA

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* Includes Q1 2010 sales generated by the Structural Products group prior to its divestiture in early March 2010.

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Dana Fort Wayne, Indiana



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Dana CMS Service

- ▶ Dana has contracted with Haas Group International for Chemical Management Services since 2004.
- ▶ Haas provides full CMS including leveraged sourcing, inventory control, purchasing, in-process system management, waste water treatment, environmental support, and ISO compliance at:
 - Ft Wayne, Indiana
 - Marion, Indiana
 - Lima, OH
 - Pottstown, PA
- ▶ Current catalog includes 1,005 distinct products.



Process Description

- ▶ Hypoid Axle Gear Manufacturing
 - Hard Turning Ring & Pinion Blanks
 - Process Options
 - Wet Cut
 - Dry Cut



Process History

- ▶ Eleven Gleason Phoenix 450 machines.
- ▶ Gear cutting on ring and pinion gears.
- ▶ Dry cut with straight hydraulic oil chip flush.
- ▶ Annual oil usage: 57,156 gallons.
 - Major losses through carry-out on high surface area chips.
- ▶ Oil leaking from roll-off boxes.
- ▶ Hot chips creating oil mist in work area.



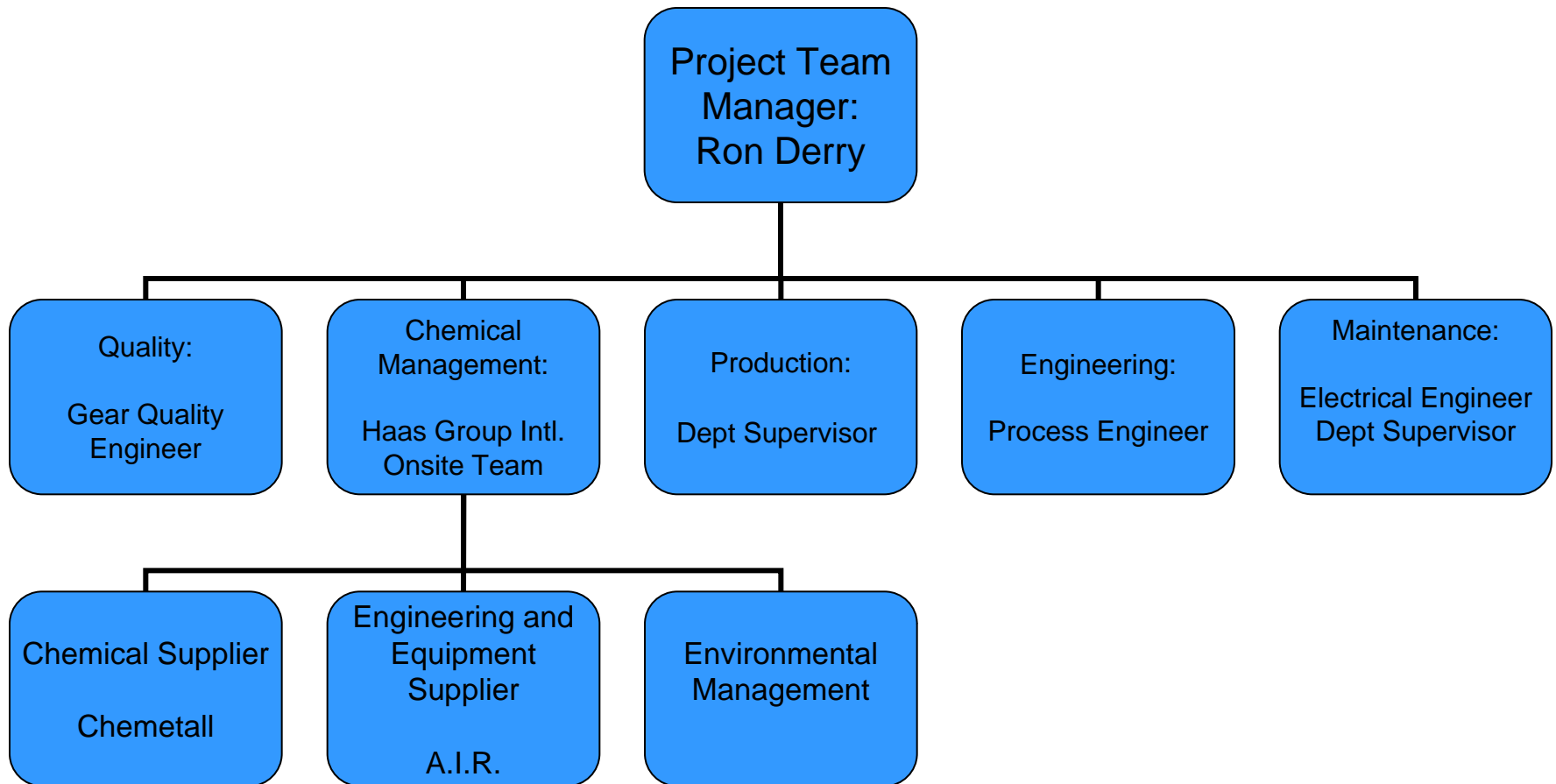
Project Inception

- ▶ Haas Group on-site team identified the Gleason 450s as high oil consumers.
- ▶ The team presented Dana Ft Wayne a business case to convert the flush coolant from hydraulic oil to water soluble coolant.
- ▶ A cross-functional team was formed to investigate the viability of the proposal.



Team Established

Cross-Functional Team



Project Goals

- ▶ Reduce Oil Consumption
- ▶ Reduce Environmental Impact
 - Meet Dana Corporate Objectives and Targets for usage and waste reductions
 - Eliminate oil leaking from roll-off boxes.
- ▶ Reduce Cost
 - Straight Oil verses recycled Semi-Synthetic Coolant
- ▶ Improve Employee Health & Safety
 - Slippery Floors & Air Quality (Oil Mist)
- ▶ Improve Machine Operations
 - Cleaner Machines & Improved Chip Flush



Process Evaluation

▶ Baseline Data

- Installed in-line flow meters. Monitored for three months.
- Tracked machine clean-out frequencies over three month period.
- Sampled and tested hydraulic system oil.
- Monitored machine faults over three month period (up-time verses down-time).
- Monitored post process washer.
 - Part Cleanliness.
 - Washer fluid contamination.



Process Evaluation

► Challenges

- B-Axis bearings lubricated by filtered flush coolant (straight hydraulic oil).



- Water based coolant will not meet lubrication needs of bearings.
- Worked with Gleason Engineers to investigate the possibility of using a Way Oil to lubricate B-Axis.
- Gleason stated that 0.5 ml AW-68 way lube per machine cycle would provide adequate lubrication.

Process Evaluation

► Challenges

- No overhead coolant supply lines to Gleason 450s.
 - Machines had supply lines from hydraulic oil tank but not recycled coolant supply lines.
- Machine Seals
 - Are machine seals compatible with a water based coolant?
 - Will water based coolant leak into hydraulic system and cause premature hydraulic oil failure?



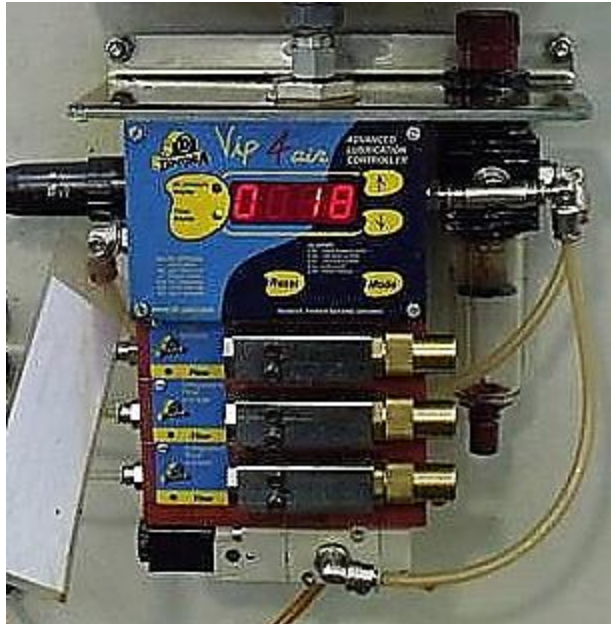
Project Planning

- ▶ Haas selected A.I.R. to evaluate the project and propose a solution that would include:
 - Alarm capabilities.
 - Dispensing 0.5 ml way oil per machine cycle.
 - Working with Dana maintenance personnel on installation.



Project Planning

- ▶ A.I.R. proposed using DropsA VIP 4 air spindle lubricators for way oil application.



The VIP 4 delivers 0.5 ml of way oil in a pulse of compressed air to evenly distribute the lubricant on critical bearing surfaces.

Project Planning

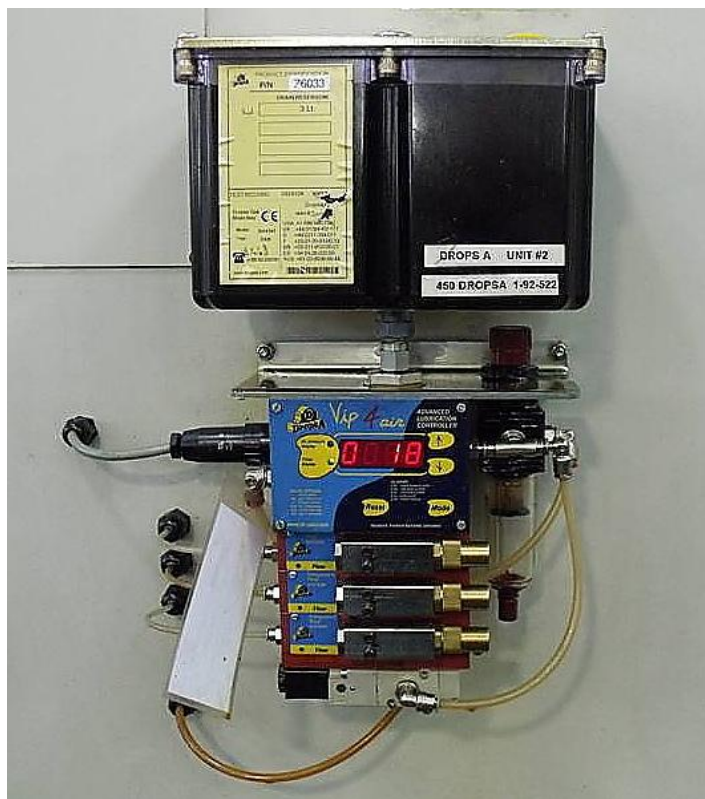
- ▶ The team contacted Gleason to ensure seal compatibility with water based coolant.
- ▶ The Tier II coolant supplier, Chemetall, completed lab testing of actual recycled coolant on all seal materials used in the Gleason 450. The seals were compatible with the coolant.
- ▶ Haas would sample hydraulic oil daily and test for water contamination once trial started.
- ▶ After reviewing the project business case, all parties agreed to proceed with a trial on one machine.



Project Trial

▶ Machine selection: Asset 1-92-516

- A.I.R. Installed DropsA VIP 4 on July 21, 2008
 - Ran system two weeks with no other changes to ensure lubrication system was working properly.



Project Trial

- ▶ Straight Oil replaced with recycled semi-synthetic coolant on August 4, 2008
 - Tested hydraulic oil daily for first week of trial, then weekly for remainder of three month trial. No contamination was present.
- ▶ Data Collection
 - Haas continued to track all baseline parameters to ensure the effectiveness of the modifications.



Trial Evaluation: Asset 1-92-516

▶ Hydraulic Oil Consumption

- Baseline: 433 gallons per month
 - Cost: \$1,732 (\$4.00 per gallon)
- Trial: 0 gallons per month
 - Cost: \$0.00 (\$4.00 per gallon)

▶ Way Lubricant Consumption

- Baseline: 0 gallons per month
 - Cost: \$0.00 (\$4.00 per gallon)
- Trial: 3.5 gallons per month
 - Cost: \$14.00 (\$4.00 per gallon)

▶ Net Savings

- \$1,718 per month; \$20,616 annual savings per machine.



Project Completion

- ▶ June 2009 – Completed installation of the DropsA Lubricators on the ten remaining Gleason 450s.
 - Completed run off of the lubricators while continuing to use the straight oil as chip flush media.
- ▶ July 2009 – Completed installation of recycled coolant piping to all eleven Gleason 450s.
 - Converted all systems to recycled house coolant.
 - Completed hydraulic oil testing weekly for four weeks, then monthly for the remainder of the 12 month validation process. No hydraulic oil contamination detected. Testing is now on a quarterly schedule.



Capital Costs

- ▶ DropsA Lubricators.
 - $\$3791 \times 11 \text{ units} = \$41,701.00$
- ▶ New coolant piping.
 - $\$2,100.00$
- ▶ **Total = \$43,801**



Year One Project Savings

▶ Actual Annual Savings:

- Hydraulic oil usage: \$228,624
- Way Oil usage: \$(1,848)
- Capital Costs: \$(43,801)
- Waste Oil reduction: \$1,439

- **Net Savings Year One : \$184,414**



Ongoing Project Savings

▶ Annual Cost Savings:

- Hydraulic oil usage: \$228,624
- Way Oil usage: \$(1,848)
- Waste Oil reduction: \$1,439
- **Net Annual Savings: \$228,215**

▶ Health and Safety:

- Reduced slip and fall incidents by 25% from July 2009 through June 2010.
- New air quality testing completed – results due October 15, 2010.

▶ Environmental:

- Net oil usage reduction: 55,308 gallons per year.
- Greatly reduced oil leakage from roll-off chip boxes.



Summary

- ▶ The on-site CMS team's comprehensive focus on chemical efficiency was instrumental in identifying this process improvement project.
- ▶ Typical challenges such as communication and organizational barriers were overcome by formation of the cross-functional team with regularly scheduled meetings.
- ▶ This project was identified as a Best Practice for Dana plants throughout North America.



Questions??



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