Application Leadership
Paint Manufacturing

June 2002

Situation Analysis

- Paints and coating manufacturing is a worldwide opportunity. In every industrialized country, there are manufacturing centers that produce a wide variety of paints and coatings for domestic and industrial usage.

- The North American paints and coating-manufacturing industry consists of over 2,000 manufacturing locations. The worldwide number is approximately 5,000.

- The paints and coating manufacturing industry is divided into five areas. Those areas are:
  - Architectural
  - Specialty
  - Maintenance
  - Marine
  - OEM

Situation Analysis

- Although paint and coatings manufacturers divide their businesses in the above areas, the manufacturing process remains consistent through all of them.
- There is one additional separation. Paints and coatings are either water or solvent based. In most cases, manufacturers will process both types at one location, but in distinct areas within the facility.
  - Paints and coatings start off as a highly filled abrasive suspension. It can be either solvent or water based.
  - The suspension is reduced with the addition of a vehicle. The vehicle is either water or an organic solvent.
  - Pigments and fillers are then added for color and body.
  - Polymeric resins are added for integrity, holding the new paint or coating together.
- These components are brought together using a batching process. They are incorporated into large vessels where they are blended and agitated. They are then filtered and packaged

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Situation Analysis

- Pumps play an essential roll in this batching process.
  - Centrifugal pumps are generally used for supplying the larger volumes of solvents from bulk tanks located outside of the facility.
  - Gear pumps and double diaphragm pumps are the clear choice for production.

- All of the fluid components used in the production batching process are introduced using either of these pump technologies.

- The exact number of pumps used in each location varies by the number of production lines.
  - In the smallest manufacturing facility, a minimum of 6 pumps will be used to manufacture either a paint or coating.
  - In larger plants, it is not uncommon to have more than 300 pumps.

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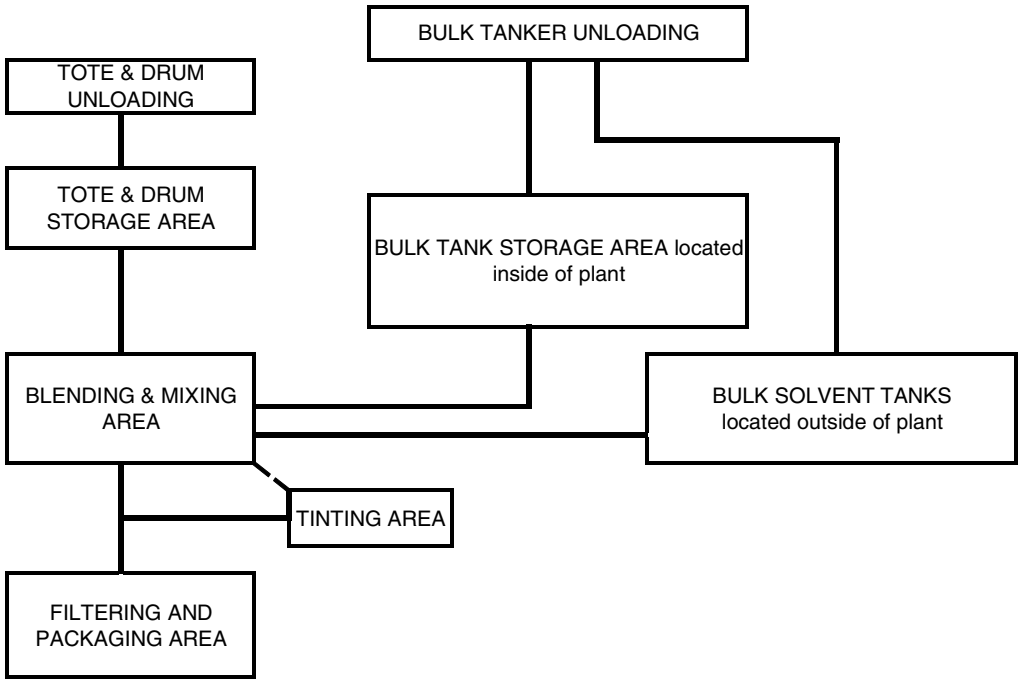
Application Basics

- There are three main areas within any paint and coating manufacturing facility.
  - Bulk storage
  - Blending / Mixing
  - Filtering and Packaging

- Within each of these areas there are opportunities for pumps.

- This is a generic paint and coating plant, illustrating the main production areas



Application Areas

- Bulk Storage
  - Bulk materials are supplied in tanker truck, tote tanks, or drums, dependent upon its volume usage.
  - Bulk materials will be stored various areas located either inside of outside the manufacturing plant.
  - High use solvents are generally stored in tank farms located outside of the manufacturing center, and are delivered in tanker trucks.
    - Electric centrifugal pumps are used to transfer the solvents from the tank farms to the blending stations.
    - Electric pumps are used because they are not prone to freezing in colder climates as other pump technologies.
    - 3” diaphragm pumps may also be used due to their flow capacity and portability.

Application Areas

- Bulk Storage
  - ➢ Raw materials, such as pigments and resins are stored inside, There are separate areas for the solvent and water based materials. Higher volume materials are stored in bulk tanks sized up 5,000 gallons.
    - 2” and 3” aluminum air operated diaphragm pumps dominate this area, although some facilities have chosen SST pumps for their capatability with water based materials.
    - Electric gear pumps have been used with the solvent based resins in facilities where the bulk storage area is several hundred feet from the blending / mixing area. Gear pumps are selected for higher viscosity (15,000cps) fluids, because of their higher pressure and flow capacity with minimal pulsation.
  - ➢ Lower volume materials are stored in either drums or 300 totes. These are generally located closer to the blending / mixing area.
    - The storage area itself will vary from having the drums / totes sitting on the main floor, to a more space efficient system with drums / totes located on a mezzanine, and finally to a combination of both systems.
    - 2” air operated diaphragm pumps are dominant in this application. Although 1” pumps may also be used for lower flow requirements, most facilities have standardized on the 2”size. The materials of construction will vary from aluminum, SST and Polypropylene due to chemical capatability.

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Application Areas

- Blending / Mixing
  - Ingredients are brought together to make the specific paint or coating. The way in which the materials are brought together ranges from manual to semi-automatic, to a fully automated system.
  - Every facility differs to some extent based on their production volume and degree of modernization. Another variable is the blending tank, which can be stationary or portable.
- The essential process steps are:
  - Introduction of dry compound
  - Reduction process with vehicle
  - Introduction of pigments and fillers, and resins
  - Tinting of paint for final color (This may be done as a separate step, off line, prior to packaging, and not as standard production process)
  - Agitation is a constant during the process of blending of components
  - Transfer to a holding tank or direct to the packaging line

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Application Areas

- Each of the fluid materials are transferred to the blending / mixing area by pumps.

- The operators know exactly how much of each component needs to be blended. The operators either tracks the material flow by weight or flow.
  - ➢ Weight: The blending tank is positioned on a scale. Starting from the known tank weight, each material is introduced separately. The weight is re-calculated prior to each material being blended.

  - ➢ Flow: There is a flow meter mounted on the supply lines of each component. Using an elaborate processor controller, the operator calls up the recipe for the paint or coating being made. The operator initiates the dispensing of the components, and watches the introduction of each component from the computer monitor.

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Application Areas

- There are two applications for diaphragm pumps in this area:
  - Supplying pigments, resins, and other components to the blending/ mixing tanks
    - A range of pump sizes from 1” to 2” are used.
    - 2” pumps are the most common for emptying totes and 1” pumps for drums
    - The size is determined by the flow requirements, but is influenced by the system design and a plant’s desire to consolidate on a specific size for conformity.
    - Where meters are used, it s essential that there is minimal pulsation. A pulsation dampener is mounted on the outlet of each pump to reduce the pressure spikes.
    - In the case of a higher viscosity material being pumped a great distance, electric gear pumps may be installed instead of air operated diaphragm pump.
  - Emptying finished paint or coating from the blending/ mixing tanks
    - By far the most common size of diaphragm pump used is the 2”.
    - 2” pumps are used for their high flow capacity, larger fluid passages, and “portability.”

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Application Areas

- Filtering and Packaging
  - ➢ The blended materials are packaged into kits. The kits will vary in size, dependent on the manufacturing facility and its designated end customer.
  - ➢ If the facility is designated to manufacture consumer paints, then the sizes could be pints, quarts, gallons or even 5-gallon containers.
  - ➢ If it is designated for industrial customers then drums may be the smallest container.

- The blended paint or coating is brought to this area either direct through piping from the blending mixing area or in the blended vessel itself.
  - ➢ In either case, the paint is filtered prior to packaging. Automated packaging lines vary, but most lines will fill the container, place a product designation label on the side, place a top on the container, and attach the handle.
  - ➢ Pump sizes of 1” to 2” are typically used.
    - The exact size is determined by the output flow they need for the packaging hopper,
    - It is heavily influenced by the population of pumps in the plant. Because of this, 2” pumps are the most common in this application.

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Application Areas

- **Tinting**
  - Most paint-manufacturing facilities will produce one base color. It is usually white. Rather than making specific colors, they do the final tinting of color at the sales point.
  - Paint intended for household, is shipped as white, and tinted at the store.
  - Paint intended for an industrial factory may be shipped directly to the end user in the desired color or it may go to the commercial store and be tinted there.

- In those facilities, which do produce colors beyond white, they need to add the additional pigments to attain the desired color.
  - The tinting pigments are generally supplied in 55-gallon drums. The drums need to be constantly agitated so it doesn't fall out of suspension and affect the color.
    - One-half inch diaphragm pumps are common because of their lower flow capacity, which gives the operator more dispensing control.
    - The Husky Drum Dispensing system is used for this application. The tint is supplied through the siphon tube mounted within the agitator. This allows for wider agitator blades, which supplies consistent agitation.

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Application Areas

- **Ball Mills**
  - After the components are blended and mixed together, and prior to the packaging process, the finished paint is put through a ball / grinding mill.
    - As the paint is pumped through the ball / grinding mill, the paint is broken down, reducing any larger particles.
    - It is imperative that the paint flows through in a consistent flow, with minimal pulsing.
  - The paint will flow through the ball / grinding mill several times. Through each pass through the ball / grinding mill the paint will reduce in viscosity slightly, and the pump will increase in speed.
  - If it flows through either too fast or too slow, it can change the color. This means the operator needs to monitor the speed of the pump, increasing and decreasing the inlet air pressure to control the speed.
    - Pump sizes from ½" to 2" are used. The exact size is determined by the output flow they need for the best filtering.
    - Remote operated diaphragm pumps that maintain flow regardless of viscosity changes are now being used more
    - CycleFlo controllers and remote Husky pumps are a good solution.

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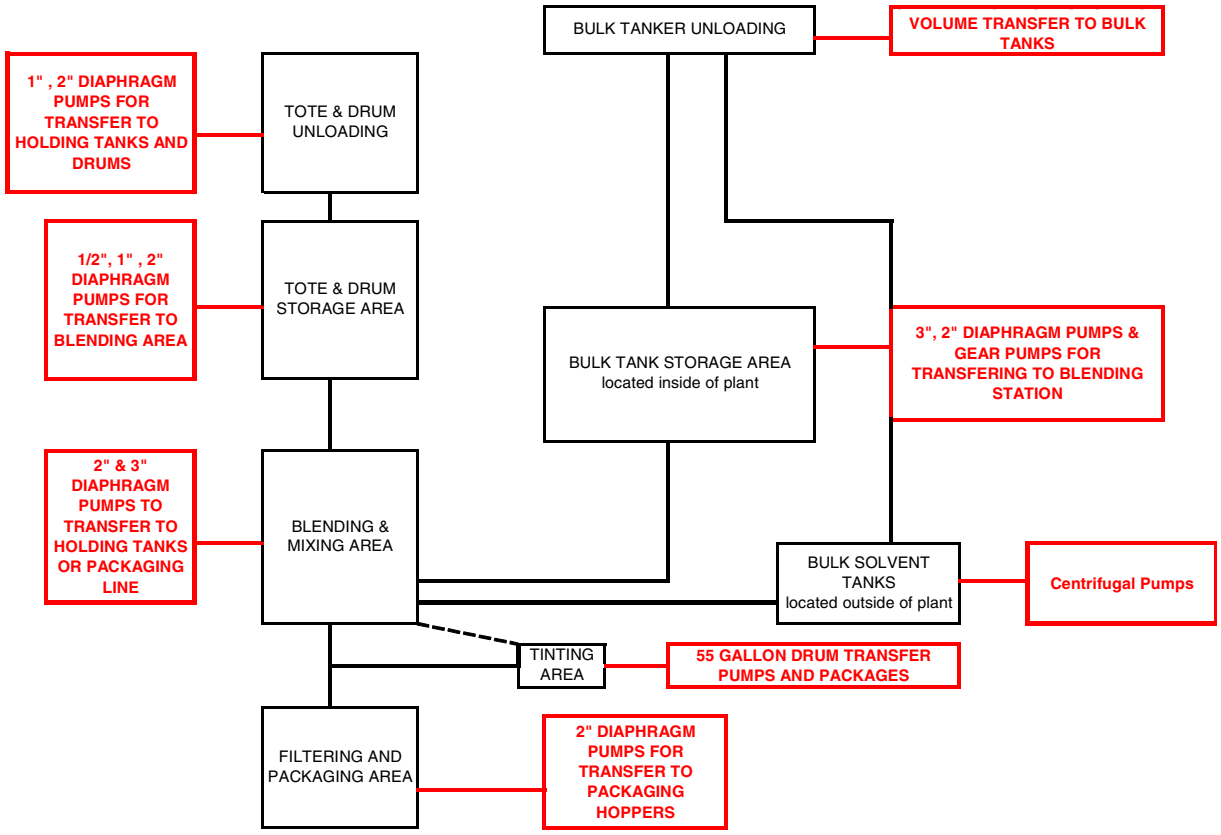
Pumping Solutions



- Diaphragm pumps are the preferred pumping technology in paint and coating manufacturing plants
- Diaphragm pumps hold key features that make it beneficial over others
- Husky pumps have additional features that make it preferred over other diaphragm pumps

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Pumping Solutions

- Air operated pumps are inherently explosion proof.
  - Many of the materials pumped have a low flash point, which requires special care
  - Adding an optional explosion proof electric motor onto a centrifugal or gear pumps greatly increase the cost of these pumps. There is no price premium with an air operated pump

- Air operated pumps stall against pressure.
  - Air operated pumps operate when air is applied and stop when the fluid line is shut off. It does not consume energy while it sits idle.
  - Electric driven pumps require a relief valve or by pass line to operate in a similar fashion. Although the pump is not pumping, the motor still may be on

- Double diaphragm pumps are simple to understand and relatively low cost
  - Diaphragm pumps are easy to repair and less expensive
  - Gear pumps requires a higher technical expertise for service and the wear items are more expensive to replace

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Pumping Solutions

- Double diaphragm pumps have large fluid passages
  - Large passages enable double diaphragm pumps to pump shear sensitive materials without any degradation
  - Gear pumps will breakdown shear sensitive materials

- Large passages enable double diaphragm pumps to pump highly filled materials without short term significant wear
  - Other pump technologies are not as forgiving as a diaphragm pump. Significant wear will occur in gear pumps

- Double diaphragm pumps have no packings or mechanical seals
  - Diaphragm pumps can run dry without any harm to the pump
  - Electric gear pumps' life is severely reduced if they run dry for any amount of time

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Graco Solutions

- Graco's Husky Diaphragm Pump solutions have additional features and technical benefits that improve the reliability and performance over the current diaphragm pumps used in the applications described.

- One common center section and the same air valve used in all 1", 1 ½" and 2" pumps:
  - Reduced number of spare parts needed to service a greater number of pump sizes
  - Maintenance personnel become more familiar with the products faster
  - Competitive manufacturers have multiple designs that may not be available in all sizes of pumps
  - Common center section and air valve on the ½" and ¾" pumps.
  - Same air valve technology used in ½" to 3" pumps

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Graco Solutions

- All of the air valve parts can be externally serviced without taking the entire pump apart:
  - In all 1”, 1 ½” 2”, and 3” pumps, the air valve parts can be easily accessed by taking off six screws from the air valve cover.
  - On the ½” and ¾” pumps the air valve parts are accessed by unscrewing the air valve cap.
  - Competitive diaphragm pumps need to be completely taken apart to access the air valve and actuator pins.

- Documented flow rates that are not affected by type of diaphragm used
  - An end-user will purchase pumps based on specific applications requirements, among them is the preferred flow rate. Flow rate is influenced by the viscosity of the material pumped, the airflow speed through the pump, and stroke length of the pump.
  - Wilden, Yamada, and Versa-Matic, change the stroke of their pump when they use PTFE diaphragms. This reduces their flow maximum flow rate by 20– 25% compared to their other elastomers.

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Graco Solutions

- Documented flow rates that are not affected by the installation of an air muffler
  - Wilden, Warren-Rupp, Aro, and Versa-Matic do not include a muffler on their 2” and 3” pumps.
  - Installation of the muffler will slow the pump speed. Their documented flow rates need to be reduced by 20% to reflect actual performance.
  - All Graco diaphragm pumps are shipped with a muffler and are not de-rated for a specific diaphragm material

- Bolted Pumps in all materials for 1” and larger sizes:
  - Pumps that are bolted together are easily assembled
  - Wilden 3” pumps that use PTFE diaphragms require the use of a hydraulic press to push fluid end and center housing together require
  - Clamps used in 1” and larger pumps will lose their clamping integrity after repeated dis-assembly. In many cases after just three pump repairs, the clamps need to be replaced

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Graco Solutions

- Longest warranty period among any diaphragm pump manufacturer
  - Five- (5) year warranty period for diaphragm pump fluid ends
  - Fifteen- (15) year warranty on the center sections:

- Longer warranty period is a good indicator of manufacturers confidence in their product design and manufacturing quality
  - No diaphragm pump manufacturer has a comparable warranty period
  - Wilden, Warren-Rupp, Versamatic, all have one (1) year warranty periods
  - Aro has a five (5) year warranty period

Selecting the right pumping solution

- Selection of the correct pump size for a specific end user
  - ➢ Utilize the Husky DPS (Diaphragm Pump Selection) Software. The software is included in the Process Equipment catalog.

- To select the right pump, the following application criteria needs to be inputted:
  - ➢ The fluid flow and working pressure required for the application
    - Maximum pressure of a diaphragm pump is at zero flow
    - Maximum flow of a diaphragm pump is at zero pressure
    - Any fluid pressures and flow rate inside of those extremes will reduce both
  - ➢ Viscosity of the fluid
    - Diaphragm pump performance curves are based on water.
    - A viscosity greater than water will reduce the maximum flow capacity
  - ➢ Distance between the supply container and the pump, and the head pressure
    - Diaphragm pump performance curves are based on a positive inlet pressure
    - Anything less than a positive inlet pressure will reduce the maximum flow
- Husky DPS automatically calculates the affects of pressure, flow, and viscosity and head pressure and selects the pump sizes that will work.

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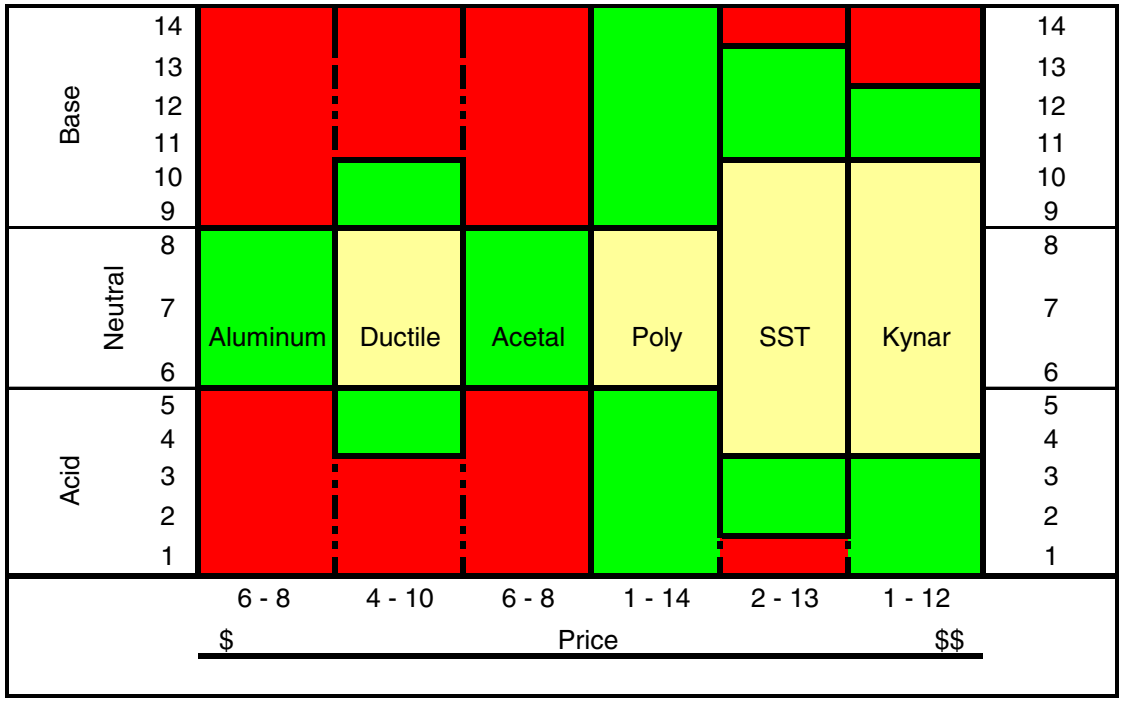
Selecting the right pumping solution



- The Husky DPS will list all of the options for the wetted ends of the pump that are compatible with the fluids being pumped.

- All of the materials listed will all work, but some materials are more accepted than others.
  - Unless the pH level of the fluid directs otherwise, aluminum is the most common material for the wetted ends, and is used for both solvent and water based materials.
  - This matrix should be used to determine the best solution from an economic viewpoint.

Selecting the right pumping solution

- Selection of the correct Ball, Seat, and Diaphragm materials
  - Use the Husky DPS program to pick the best combination for the fluid to be pumped
  - The Husky DPS lists all of the materials that will work with the fluids pumped.
  - All of the materials listed will all work, but some materials are more accepted than others: As a general rule:
    - A Stainless steel / PTFE combination (xxx311) is the best option for solvent based materials.
    - A Geolast combination (xxxGGG) is the best option for water-based materials, but Hytrel (xxx555) also works
    - Buna is the most common elastomer used for water based materials. Buna is a ”true” elastomer. Graco does not offer Buna in the larger pump sizes (1 ½”, 2”, and 3”.) Geolast is a man-made elastomer that closely resembles Buna. It contains some Polypropylene, which make it conducive for more abrasive materials.

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Graco ROI Solutions

- Graco has a distinct flow advantage over most of the diaphragm pump competitors
- Manufacturers vary their flow rate in each pump size based on the air valve type, model type, diaphragm used, and if it is supplied with a muffler
- The following chart shows the averaged numbers

	AVERAGE FLOW RATES PER SIZE & ALL AVAILABLE MODELS: INCLUDES DERATES									
	1/2"	The **Husky** Difference	1"	The **Husky** Difference	1 1/2"	The **Husky** Difference	2"	The **Husky** Difference	3"	The **Husky** Difference
GRACO	15	-	40	-	100	-	150	-	275	-
ARO	13	15%	41	-2%	80	25%	126	19%	220	25%
VERSAMATIC	11	36%	38	5%	49	104%	100	50%	163	69%
WARREN RUPP	15	0%	41	-2%	65	54%	110	36%	198	39%
WILDEN	13	18%	30	33%	56	79%	107	40%	160	72%
YAMADA	11	36%	42	-5%	108	-7%	143	5%	187	47%
AVERAGE	12.5	20%	38	4%	71.6	40%	117	28%	186	48%

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Graco ROI Solutions

- The flow advantage the Husky have over the competition, can be measured and calculated into a return on investment to the end user
  - ➢ Higher flow rates capacity means the pump will run slower and deliver the same flow
  - ➢ A slower cycle speed means that the time between repairs is increased, and the annual repair budget is reduced
- Insert production numbers and the “Husky difference” from previous page

PARTS SAVINGS			COST OF PARTS/REPAIR	X	# OF REPAIRS PER YEAR	=	TOTAL YEAR PART COST	X		=	SAVINGS ($)
LABOR SAVINGS	# OF HOURS TO REPAIR PUMPS	X	HOURLY LABOR RATE	X	# OF REPAIRS PER YEAR	=	TOTAL LABOR COST	X		=	SAVINGS ($)
PRODUCTION SAVINGS	TIME TO REMOVE PUMP FROM PRODUCTION LINE	X	PRODUCTION DOWNTIME COST	X	# OF TIMES PUMP IS REPLACED	=	TOTAL YEARLY DOWNTIME COST	X		=	SAVINGS ($)

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PROCESS EQUIPMENT

Air-Operated Pumps and Accessories for Process Industries

PROCESS

PROVEN QUALITY. LEADING TECHNOLOGY.

Superior Pumping Technology

AIR-OPERATED PUMPS

The Most Durable Piston and Diaphragm Pumps!

At Graco®, we provide durable pumping solutions for your applications. Every pump is manufactured with your productivity in mind – providing you a more reliable, efficient pump!

- **Rugged construction** resists corrosion and ensures clean fluid changes.
- **Heavy-duty design** offers long life, increased productivity and lower overall cost of ownership.
- **Air-powered** for increased reliability and lower costs.
- **Pneumatically driven** for increased reliability and power on demand service.

KEY FLUIDS

- Paints, stains, coatings, inks and dyes
- Chemicals
- Acids
- Corrosive and abrasive fluids
- Lubricants
- Ceramic glazes
- Sludge, slurry and waste fluid
- Soaps, detergents and solvents

KEY APPLICATIONS

- Transferring fluids from drums
- Sanitizing buildings and equipment
- Removing waste fluid
- Unloading fluids
- Draining tanks and sumps
- Transferring high temperature acids
- Skimming and transferring oil
- Servicing lubrication equipment

THE LONGEST WARRANTY AVAILABLE IN THE INDUSTRY!

Graco is so confident in the design of our Husky products and the manufacturing process, we offer an extended warranty on most products – including the longest warranty in the industry for diaphragm pumps!

Perfect for a Wide Range of Applications

Bulk Tank Supply and Evacuation

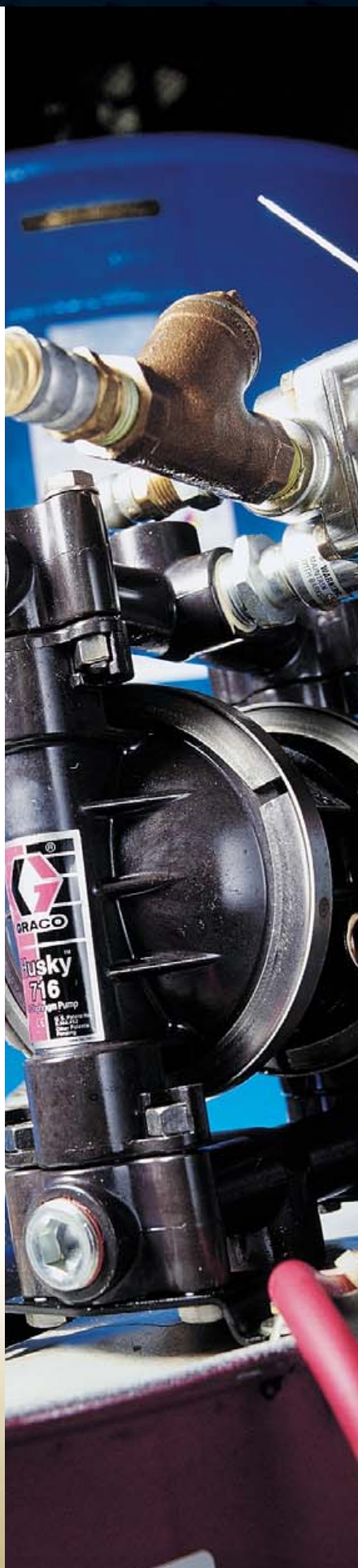
Husky™ air-operated double diaphragm pumps are ideal for unloading above or below ground tanks of any size. They are available in a wide range of materials of construction in sizes including: **1/4 in (6.3 mm), 3/8 in (9.4 mm), 1/2 in (12.7 mm), 3/4 in (19.1 mm), 1 in (25.4 mm), 1-1/2 in (38.1 mm), 2 in (50.8 mm) and 3 in (76.2 mm).**

55 Gallon Drum Transfer and Supply

Pump from your 55 gallon drums with ease with one of two styles of pumps – double diaphragm or piston evacuation. They offer flow rates up to 12 gpm, and are available in several materials of construction including: **aluminum, carbon steel, stainless steel, polypropylene and acetal.**

Maintenance and Production Cleaning

Designed for rugged dependability, pneumatically-driven pumps offer simplicity in design, operation and maintenance. They provide high pressure for water and cleaning chemicals up to 3,400 gpm, and flow rates up to 9 gpm.



Air-Operated Double Diaphragm Pumps

Model Overview




MODEL	HUSKY 205	HUSKY 307	HUSKY 515	HUSKY 716
Connection Size	1/4 in (6.3 mm)	3/8 in (9.4 mm)	1/2 in (12.7 mm) or 3/4 in (19.1 mm)	3/4 in (19.1 mm)
Maximum Flow Rate*	5 gpm (19 lpm)	7 gpm (26 lpm)	15 gpm (57 lpm)	16 gpm (61 lpm)
Materials of Construction Available	Polypropylene, Kynar (PVDF), Acetal	Polypropylene, Acetal	Polypropylene, Kynar (PVDF), Acetal	Aluminum, 316 Stainless Steel
Center Section Available	Polypropylene	Coated Aluminum	Polypropylene	Polypropylene
Typical Fluids Handled	Waterborne materials, paint, coatings, inks, car wash chemicals	Paints, lubricants, inks, stains, solvents, coatings and dyes	Cleaning fluids, detergents, chemicals, ceramic glazes, inks	Oil, water and most solvents

**Flow rates are with muffler and do not vary based on diaphragm material*
Note: Husky 307 and Husky 3275 are only available with standard air valves. All other pumps are available with standard or remote air valves

Accessories

FLANGE KIT

- Converts a thread pump connection to ANSI
- Converts ANSI pump connection to thread

INLET FLOW CONTROL

- Agitators or mixers that keep fluid in suspension within a tank, vat or drum

MUFFLERS

- Reduces sound level of pump during exhaust
- Comes standard on all Graco models

AIR INLET CONTROL

- Regulators control speed and pressure of pump

HUSKY 1040	HUSKY 1590	HUSKY 2150	HUSKY 3275
1 in (25.4 mm)	1-1/2 in (38.1 mm)	2 in (50.8 mm)	3 in (76.2 mm)
40 gpm (151 lpm)	100 gpm (379 lpm)	150 gpm (568 lpm)	275 gpm (1041 lpm)
Polypropylene, Kynar (PVDF), Acetal	Polypropylene, Kynar (PVDF), Aluminum, 316 Stainless Steel	Polypropylene, Kynar (PVDF), Aluminum, 316 Stainless Steel, Ductile Iron	Aluminum
Coated Aluminum, 316 Stainless Steel	Coated Aluminum, 316 Stainless Steel	Coated Aluminum, 316 Stainless Steel	Coated Aluminum
Chemicals, contaminated surface water, acids, adhesives and varnishes	Chemicals, corrosive fluids, acids, latex, abrasive fluids, slurries and sludge	Acids, gases, ship cleaning, stripping chemicals, alkalies, solvents, paints and varnishes	Chemicals, bulk paint resins and ceramic slip

OUTLET CONTROL

- Surge suppressor reduces pressure spikes during pump changeover
- Filter and strainer removes large particles from out-bound fluid stream

LEAK DETECTOR

- Contains leakage if diaphragm fails
- Signals automatic pump shut down and sounds optional alarm

CYCLEFLO™

- Controls speed and pressure on remote pumps
- Used in dosing applications

The Husky Diaphragm Pump Advantage

The Simplicity of the Husky Air Valve

Our Husky air-operated double diaphragm pumps feature extremely reliable, externally serviceable air valves – making these Husky pumps among the best in the industry!

Top view of air valve

FEATURES AND BENEFITS

- Fewer moving parts means increased durability and less repair time
- Three-way pilot valve for true non-sticking operation
- Externally serviceable for quick, inexpensive repairs
- The elimination of o-rings and a spool valve prevents centering; a common problem with competitive pumps
- Lube-free operation for cleaner operation – essential when handling food products

Reduce Downtime and Save Money!

When it comes to chemical, sanitary and ink applications, it's tough to beat these Graco pumps! Our Husky air-operated double diaphragm pumps are loaded with features to help you get the job done right, every time, and are built to save you money.

Graco Air Valve

Competitor Air Valve

System Components

A EASY MAINTENANCE

- Low internal volume reduces waste and makes clean-up easy
- Stainless steel bolts resist corrosion and provide positive positioning for easy reassembly

B UNIQUE, PATENTED AIR VALVE

- Three-way pilot valve for no-stick operation
- All parts are easily accessible
- No air-line lubrication required

C PRECISION-FITTED PARTS

- Long-wearing end bearings assure positive rod alignment and are easy to replace

D PROTECTIVE EXHAUST PORT

- Common port for all exhaust prevents vapors in room from attacking air motor seals
- Easily submerges for sump or disposal operations sitting idle

E RUGGED EXTERIOR CONSTRUCTION

- Construction resists corrosion, prevents leakage and ensures clean fluid changes
- Aluminum center sections are epoxy coated
- Corrosion resistant centers are 316 stainless steel

F FLUID COMPATIBILITY

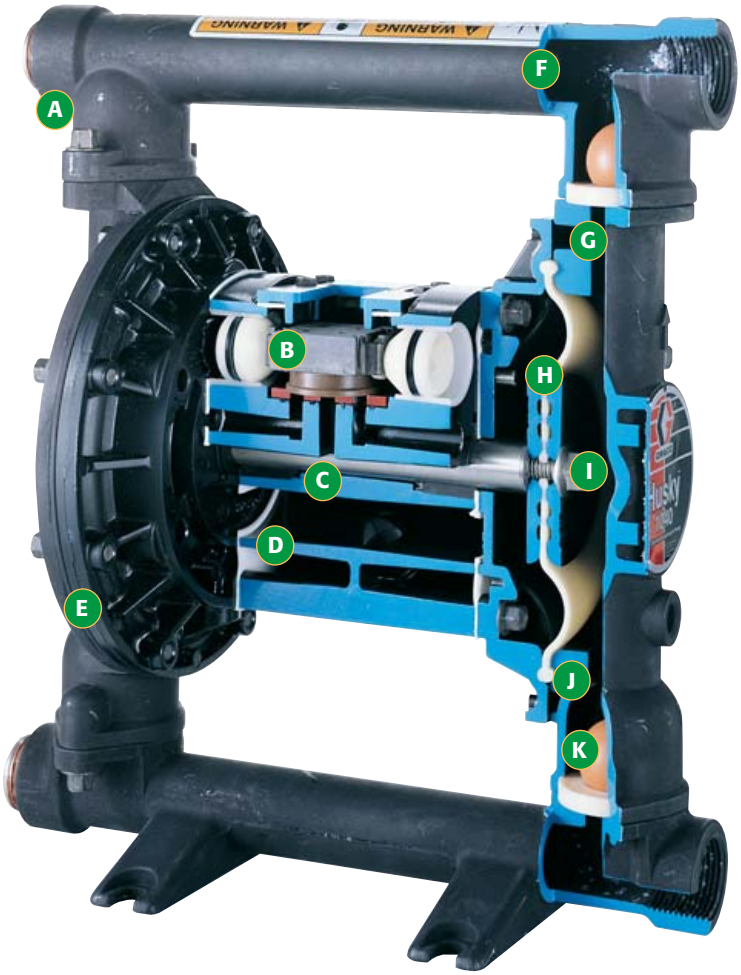
- Housings available in aluminum, stainless steel, ductile iron, polypropylene, groundable acetal or Kynar

G POSITIVE SEAL DESIGN

- Diaphragm firmly locked in place
- Formed bead acts as a positive fluid seal
- One thru-hole

H HEAVY DUTY DIAPHRAGM PLATES

- Positive grip plates virtually eliminate leakage and pull-out, preventing costly downtime



I LONG LASTING ROD DESIGN

- 300 Series stainless steel rod designed for long life and corrosion resistance—even in wet air

J EASY ALIGNMENT

- Bolted, self-aligning air and fluid sections

K CHOICE OF ELASTOMERS

- Wide range of seat and ball options ensure fluid compatibility and positive seal for maximum efficiency, long life and better suction lift

Transfer Pumps

FAST-FLO® 1:1

HUSKY 515 TRANSFER

HUSKY 716 TRANSFER

Air-Powered for High Reliability at an Affordable Price!

Perfect for low to medium viscosity fluids and shear sensitive materials. Transfer pumps offer superior reliability at an affordable price!

PISTON PUMPS

- Flow rates up to 5 gpm
- Stainless steel and carbon steel options
- Drum length versions have inlet immersed in material for quicker priming of heavier fluid
- Immersed inlets hold prime better than non-immersed
- Available with optional stubby and drum length models
- Air-powered for high reliability and low cost
- Plate (flat) check options for lower viscosity fluids
- UL and CE options available when installed in accordance with NFPA

HUSKY TRANSFER PUMPS

- Excellent for abrasive, low to medium viscosity fluids and shear sensitive materials
- Suction tube is immersed inside the drum – not the pump
- Quick-priming and immediate flow of product
- Handles fluid viscosities up to 5,000 cps and solids up to 0.09 in (2.29 mm)
- Runs dry without damaging the pump
- Provides air tight seal for moisture-sensitive fluids
- Bung adapter fits into any 2 in (50.8 mm) bung opening
- Easy-out seal provides fast slide in and out of drums without disconnecting hoses and accommodates slightly off-sized drums up to 2–1/2 in (63.5 mm)

Hydra-Clean® Pumps

On-Demand High Pressure Cleaning Pumps

Graco Hydra-Clean heavy-duty pressure washers support multiple guns and are perfect for use in a variety of in-plant cleaning applications.

FEATURES AND BENEFITS

- Versatility in variable pressure, flow and chemical injection provides best cleaning action
- Some models available with chemical injectors
- Configurations available to fit most in plant application requirements
- On demand supply pump stops when valve is closed and runs when valve open
- Does not require an automatic shut off when not in use
- Cleaning chemical passes through pump, providing concentrate levels above 5%
- Multiple gun capacity (determined by the tip size)
- For use with cold or hot water up to 200°F (93°C)

BULLDOG 10:1
CART MOUNT

PRESIDENT 10:1
OPEN DRUM MOUNT

PREMIER® 34:1

Ordering Information

HUSKY FLUID COMPATIBILITY

To assist you in your ordering process, the chart below provides recommended materials of construction for a variety of fluids. Please contact your local distributor for specific part numbers and www.graco.com for additional product information.

Part Number	Wetted Parts	Seats	Balls	Diaphragms	Common use
Husky 205 : 1/4 in (6.35mm) ports					
D11021	Acetal	Acetal	Acetal	PTFE	Clear solvents
D12091	Poly	Poly	Poly	PTFE	Clear neutral pH fluids
D150A1	PVDF	PVDF	PVDF	PTFE	Concentration of high temperature acids and bases: clear hydrofluoric and hydrochloric acids
Husky 307 : 3/8 in (9.52mm) ports					
D31255	Acetal	Acetal	Hytrel	Hytrel	Mid range pH solvents and solventborne coatings: water, oil, etc.
D31211	Acetal	Acetal	PTFE	PTFE	Low solids, coatings, stains and lacquers
D32911	Poly	Poly	PTFE	PTFE	Full pH range acids, bases and neutrals without abrasive materials: sulfuric and nitric acids
D32966	Poly	Poly	Santoprene	Santoprene	An alternative to 911 combinations where temperature and acidity is not as strong
D32955	Poly	Poly	Hytrel	Hytrel	Water and other neutral non-solvent fluids, water based coatings, and adhesives
Husky 515 : 1/2 in (12.7mm) ports					
D51211	Acetal	Acetal	PTFE	PTFE	Solvents and solventborne coatings
D51311	Acetal	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: solventborne coatings
D52911	Poly	Poly	PTFE	PTFE	Full range of pH acids, bases and neutrals without abrasive materials: sulfuric and nitric acids
D52966	Poly	Poly	Santoprene	Santoprene	An alternative to 911 combinations where temperature and acidity is not as strong
D55A11	PVDF	PVDF	PTFE	PTFE	High concentration of high temperature acids and bases: abrasive, acidic or caustic material
Husky 716 : 3/4 in (19.05mm) ports					
D53211	Aluminum	Acetal	PTFE	PTFE	Solvents and solventborne coatings
D53277	Aluminum	Acetal	Buna	Buna	Water and other neutral non-solvent fluids, water based coatings, and adhesives
D53311	Aluminum	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: solventborne coatings
D54311	SST	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: waterborne coatings
D54331	SST	SST	SST	PTFE	Higher viscosity, medium pH range acids and bases: high solid waterborne coatings
Husky 1040 : 1" in (25.4mm) ports					
D72911	Poly	Poly	PTFE	PTFE	Full range of pH acids, bases and neutrals without abrasive materials: sulfuric and nitric acids
D72966	Poly	Poly	Santoprene	Santoprene	An alternative to 911 combinations where temperature and acidity is not as strong
D73525	Aluminum	Hytrel	Acetal	Hytrel	Good general purpose combination for water, oil, windshield fluids
D73GGG	Aluminum	Geolast	Geolast	Geolast	Neutral pH fluids that contain abrasive materials. petroleum products, waterborne paints
D73311	Aluminum	SST	SST	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: solventborne coatings
D74311	SST	SST	SST	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: waterborne coatings
D75A11	PVDF	PVDF	PTFE	PTFE	High concentration of high temperature acids and bases: abrasive acidic or caustic material
DR2911	Poly	Poly	PTFE	PTFE	Full range of pH acids, bases and neutrals without abrasive materials: sulfuric and nitric acids
DR4311	SST	SST	SST	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: acidic and nitric acids
DR5A11	PVDF	PVDF	PTFE	PTFE	High concentration of high temperature acids and bases: abrasive acidic or caustic material
Husky 1590 : 11/2" in (38.1mm) ports					
DB2911	Poly	Poly	PTFE	PTFE	Full range of pH acids, bases and neutrals without abrasive materials: sulfuric and nitric acids
DB2966	Poly	Poly	Santoprene	Santoprene	An alternative to 911 combinations where temperature and acidity is not as strong
DB3525	Aluminum	Hytrel	Acetal	Hytrel	Good general purpose combination for water, oil, windshield fluids
DB3GGG	Aluminum	Geolast	Geolast	Geolast	Neutral pH fluids that contain abrasives. Petroleum products, waterborne paints
DB3311	Aluminum	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: solventborne coatings
DB4311	SST	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: waterborne coatings
DB5A11	PVDF	PVDF	PTFE	PTFE	High concentration of high temperature acids and bases: abrasive acidic or caustic material
DT2911	Poly	Poly	PTFE	PTFE	Full pH range acids, bases and neutrals without abrasive materials: sulfuric and nitric acids
DT4311	SST	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: acetic and nitric acids
DT5A11	PVDF	PVDF	PTFE	PTFE	High concentration of high temperature acids and bases: abrasive acidic or caustic material

Continued on next page

HUSKY FLUID COMPATIBILITY, CONTINUED

Part Number	Wetted Parts	Seats	Balls	Diaphragms	Common use
Husky 2150 : 2" in (50.8mm) ports					
DF2911	Poly	Poly	PTFE	PTFE	Full pH range acids, bases and neutrals without abrasive materials: sulfuric and nitric acids
DF2966	Poly	Poly	Santoprene	Santoprene	Used as alternative to 911 combinations where temperature and acidity is not as strong
DF3525	Aluminum	Hytrel	Acetal	Hytrel	Good general purpose combination for water, oil, windshield fluids
DF3311	Aluminum	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: solventborne coatings
DF3GGG	Aluminum	Geolast	Geolast	Geolast	Neutral pH fluids with abrasives. petroleum products, waterborne paints
DF4311	SST	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: solventborne coatings
DF4666	SST	Santoprene	Santoprene	Santoprene	Good general purpose combination for non solvent, middle range pH materials
DF5A11	PVDF	PVDF	PTFE	PTFE	High concentration of high temperature acids and bases: abrasive acidic or caustic material
DV2911	Poly	Poly	PTFE	PTFE	Full range of pH acids, bases and neutrals without abrasive materials: sulfuric and nitric acids
DV4311	SST	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: acidic and nitric acids
DV5A11	PVDF	PVDF	PTFE	PTFE	High concentration of high temperature acids and bases: abrasive acidic or caustic material
Husky 3275 : 3" in (76.2mm) ports					
DK3GGG	Aluminum	Geolast	Geolast	Geolast	Neutral pH fluids that contain abrasive materials: petroleum products and waterborne paints
DK3525	Aluminum	Hytrel	Acetal	Hytrel	Good general purpose combination for water, oil, windshield fluids
DK3666	Aluminum	Santoprene	Santoprene	Santoprene	Good general purpose combination for non solvent, middle range pH materials
DK3311	Aluminum	SST	PTFE	PTFE	Wide pH range of acids, bases and neutral materials that contain solids: solventborne coatings

PISTON PUMPS

Part Number	Pump Material	Seat Material	Packings	Certificates
226940	Carbon Steel	Disc	PTFE/Leather	UL, CE
226941	Carbon Steel	Disc	Polyethylene	UL
226942	Stainless Steel	Ball	Polyethylene	UL
226944	Carbon Steel	Disc	Polyethylene	UL, CE
226945	Stainless Steel	Ball	Polyethylene	UL
226946	Stainless Steel	Ball	PTFE	
237129	Stainless Steel	Ball	PTFE	
237132	Stainless Steel	Ball	PTFE	

TRANSFER PUMPS

Part Number	Description	Tube Type
233051	D52911	Polypropylene tube
233052	D51211	Stainless Steel tube
233053	D51211	Aluminum tube
233054	D53266	Aluminum tube
233055	D53277	Aluminum tube
233056	D53211	Aluminum tube
233057	D54311	Stainless Steel tube

HYDRA-CLEAN PUMPS

Model	10:1 President	10:1 Bulldog	34:1 Premier
Part Number	205515	226314	965389
Max. Flow Rate	3 gpm (11.4 lpm)	8 gpm (29 lpm)	9.2 gpm (34.8 lpm)
Mounting	Side drum	Portable cart	Portable cart
Hose Length*	40' x 3/8"	40' x 3/8"	40' x 3/8"
Hydra-Clean Gun*	208008	208008	208008
Tip*	103921	103921	103921
Flow rate @ 700 psi	2.3 gpm (8.9 lpm)	2.3 gpm (8.9 lpm)	2.3 gpm (8.9 lpm)
Flow rate @ 1000 psi	2.7 gpm (10.2 lpm)	2.7 gpm (10.2 lpm)	2.7 gpm (10.2 lpm)
Chemical Injector	Not included	Not included	Included

**Included with standard Hydra-Clean order*

PROCESS PUMPS

ABOUT GRACO

PROVEN QUALITY. LEADING TECHNOLOGY.

Founded in 1926, Graco is a world leader in fluid handling systems and components. Graco products move, measure, control, dispense and apply a wide range of fluids and viscous materials used in vehicle lubrication, commercial and industrial settings.

The company's success is based on its unwavering commitment to technical excellence, world-class manufacturing and unparalleled customer service. Working closely with qualified distributors, Graco offers systems, products and technology which set the quality standard in a wide range of fluid handling solutions. Graco provides equipment for spray finishing, protective coating, paint circulation, lubrication, and dispensing sealants and adhesives, along with power application equipment for the contractor industry. Graco's ongoing investment in fluid management and control will continue to provide innovative solutions to a diverse global market.

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PROCESS APPLICATION

PAINT MANUFACTURER'S NEW PUMPS REDUCE MAINTENANCE PROBLEMS

Home Hardware uses over 100 Graco Husky pumps throughout its paint production facility.

CUSTOMER
Home Hardware, Burford, ON

APPLICATION
Processing & Packaging Paint

PROBLEM
Pump maintenance problems were too high.

SOLUTION
Graco Husky diaphragm pumps

RESULTS
Maintenance reduced significantly; less parts inventory.

Pumps play an essential role in the manufacture of paint because they are the main tools used to transfer the raw and manufactured materials from one production step to the next. They are used in the bulk transfer/storage process, mixing/blending process and packaging process. Large paint manufacturers often employ hundreds of pumps and maintaining this equipment can be a continuous chore. If a pump breaks down, it can cause major production problems in this fast-paced environment.

Pump problems used to be a big headache for Danny Marsh and his maintenance crew at Home Hardware's Paint & Home Products Division in Burford, ON. The Division manufactures paint and home-cleaning products for approximately 1000 independently owned Home Hardware stores in Canada

"We use between 120 to 140 diaphragm pumps in our facility, ranging is size from 3/8-inch to 3-inch diameter pumps," says Marsh. "Pump repair used to be a significant part of our maintenance work. We were troubleshooting pump problems daily."

Marsh chalked the problems up to a number of causes. "Through the years, we had acquired diaphragm pumps from at least a half-a-dozen different pump manufacturers. Each one of these different pumps required its own repair kits and parts. Some of these pumps were easy to repair but others would require a major tear down just to replace a minor wear part."

"Furthermore, we never knew how many repair kits or parts to have on hand because we couldn't gauge a pumps' reliability" says Ken Winn, Industrial Millwright. "To cover all our bases, we had to stock replacement kits and parts for all our pumps. It was a pretty big inventory. We also had drawers of extra o-rings, pins and parts mixed up together from opened kits. It was a nightmare trying to match these parts with the right pump."

In an effort to reduce maintenance and consolidate inventory, the department decided to reduce the number of pumps they used from different manufacturers. After monitoring their diaphragm pumps for a period of time and researching the benefits each brand offered, the maintenance department selected Graco's Husky diaphragm pumps as their main transfer pumps throughout the facility.

"We selected the Husky pumps for a variety of reasons," says Winn. "First of all, they have proved to be extremely reliable. We've reduced our maintenance associated with pumps significantly."

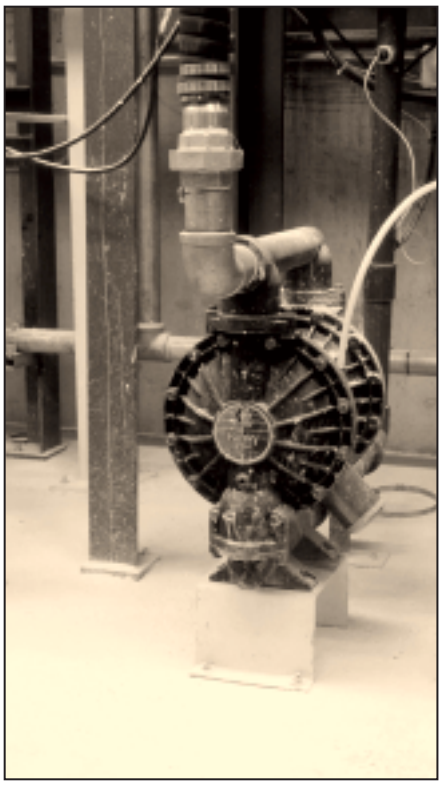
Also, some of the spare parts are the same for various pumps. For instance, a common center section and the same air valve are used in all of the Husky 1-, 1-1/2, and 2-inch pumps. "We've reduce our repair kit and parts inventory by 70%," he adds.

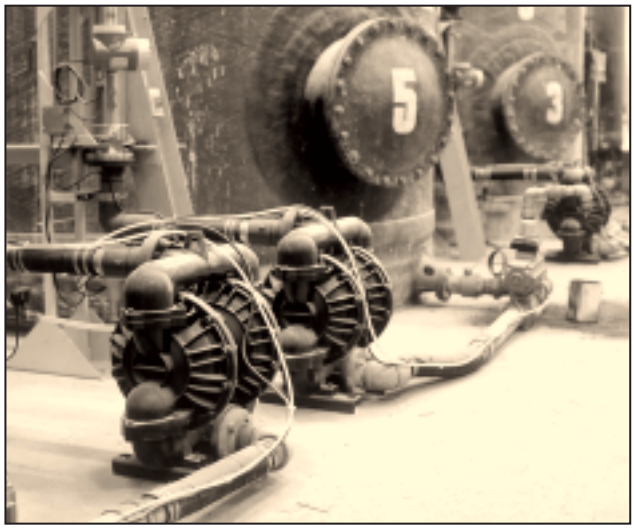
Furthermore, the pumps are easy to maintain. All the air

valve parts can be serviced externally without taking the entire pump apart. Also, there are fewer parts that make it easier for the maintenance crew to become familiar with the pumps. And unlike some other diaphragm pumps that require you to change the shaft, inner and outer pistons when you convert a pump to PTFE the Husky pumps can be converted from Hytrel to PTFE without modifying or substituting parts.

Most of the pumps that Home Hardware has are Aluminum/Hytrel. Some are Stainless PTFE and the rest are Aluminum PTFE Material compatibility and cost were the main issues in going with the construction of the pumps. The selection also reduced inventory and overall cost.

Home Hardware's local distributor also played an important role in their decision to install the Husky pumps. "We've always received prompt service from our Graco distributor," says Marsh. "He pays regular visits, is responsive to our needs, and provides invaluable product information. That's not always the case with some of our suppliers. He's a valuable resource and we appreciate it."





Production Overview

Home Hardware produces waterbase and alkyd paints in a full spectrum of colors at the facility. Raw ingredients are delivered to the facility by truck tankers. Home Hardware uses high volume, 3-inch Husky pumps to unload bulk tankers and transfer the raw materials to 10,000 gallon holding tanks. These raw materials include solvent and waterbase resins. From these tanks, 3-inch pumps transfer the raw materials to the blending/mixing stations.

Ingredients are blended and mixed at this station to make specific paints. Home Hardware uses a sophisticated computer system to assure ratio accuracy and consistency from one batch to the next. An operator calls up a specific recipe, initiates the dispense cycle and monitors the transfer of each ingredient from his computer screen. The system uses flow rate to track the amount of the ingredients added to the mix tanks. In addition to liquid ingredients, Husky pumps also transfer very viscous pigments from grinding tanks to the mix tanks.

From here, the mixed paint is transferred to bulk tanks where it is stored until another pump transfers the paint to the packaging line where it is metered into 1 liter, 1 & 5 gallon containers. Throughout the process, batches are graded and color matched for quality. It's a high production, fast paced environment.

"Right now we have a very efficient transfer system," says Marsh. "We were lucky to be able to convert many of the old diaphragm pumps to the new Husky's during a plant expansion project in 2000. We also upgraded to a total of 375 hp in compressors, which provides significant power to operate all our air-powered equipment. We'll continue converting our remaining old diaphragm pumps to Graco Husky pumps as the old ones wear out."

"The Husky pumps have allowed us to focus on other maintenance projects," adds Winn. ""They've reduced our pump maintenance problems significantly. •

Danny Marsh, Maintenance Supervisor (front), and Ken Winn, Industrial Millwright, at Home Hardware's Burford, ON facility.

Home Hardware's Husky system was installed and serviced by

JET
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