29 October 2019

Bypass Pumping 101

NASTT NORTHEAST REGIONAL CHAPTER

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Overview

- Understanding System Components
- Sizing The Pump(s) For The Application
- Risk Management
- Summary

System Components

System Components

System Components Design

- Flow
- Design
- Strength

System Components Physical Conditions

- Flow
- Elevation
- Distance

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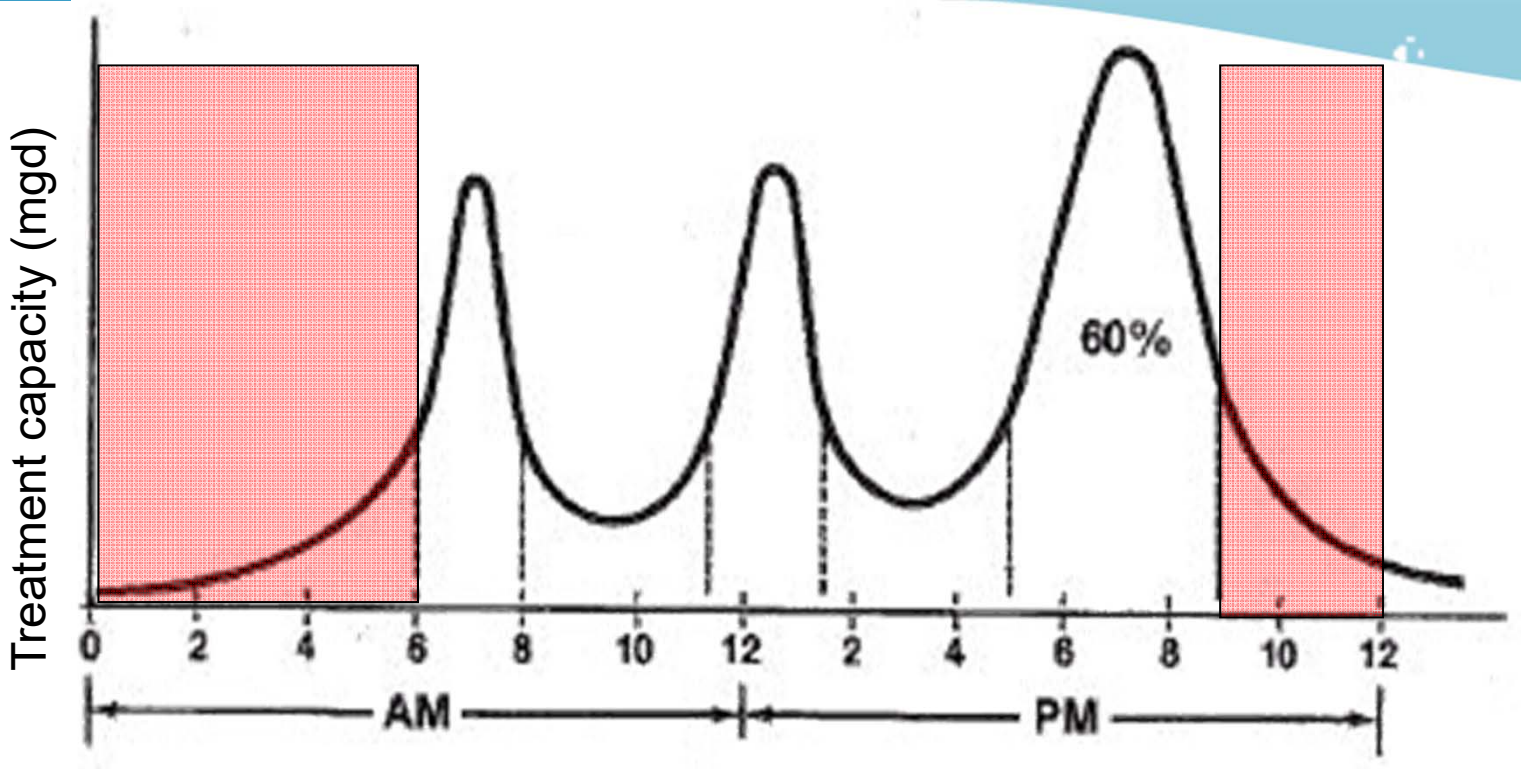
System Components

What You Should Know About Existing Conditions:

- Line size, condition, quantity
- Flow Conditions (Low, Peak, Average Flow)
- Product being pumped (Solids, pH, Temperature, Chemicals, Sludge, Slurry)
- Suction & Discharge Point Depth and Footprint
  (Suction Lift & Line Configuration)
- Profile and Plan Details (HGL, Road Crossings, Obstacles)
- Project Duration (Diesel vs. Electric)
- Environmental & Health Issues (Noise, Emission Regulations)

System Components: Flow



Sewage flow duration pattern for a typical municipality

- Gravity sewer flows vary during the day with peak times at 6:00-9:00 AM and 6:00-9:00 PM.
- Storm water may enter lines through cracks, which will dramatically increase flow during rain events.

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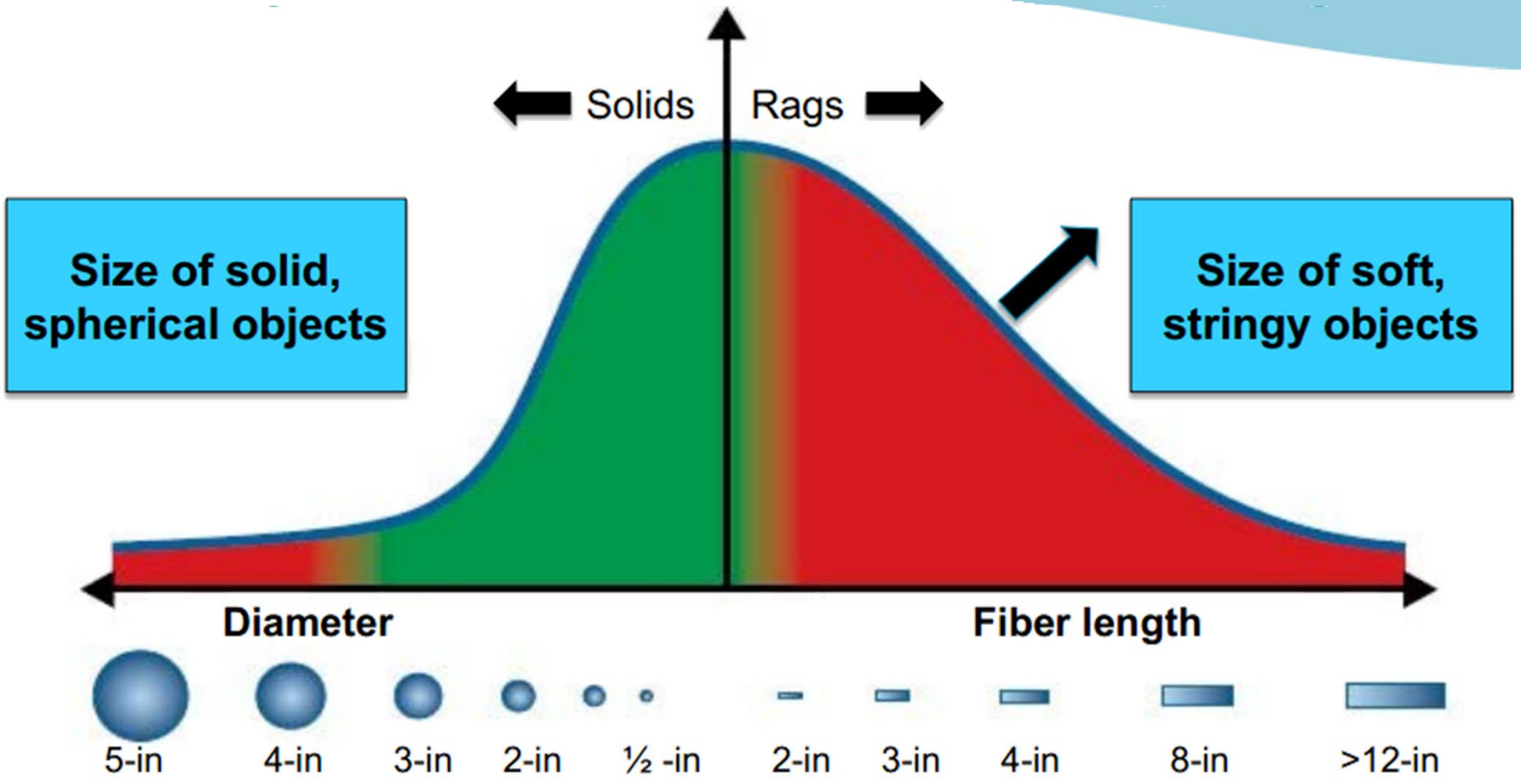
System Component: Product Pumped



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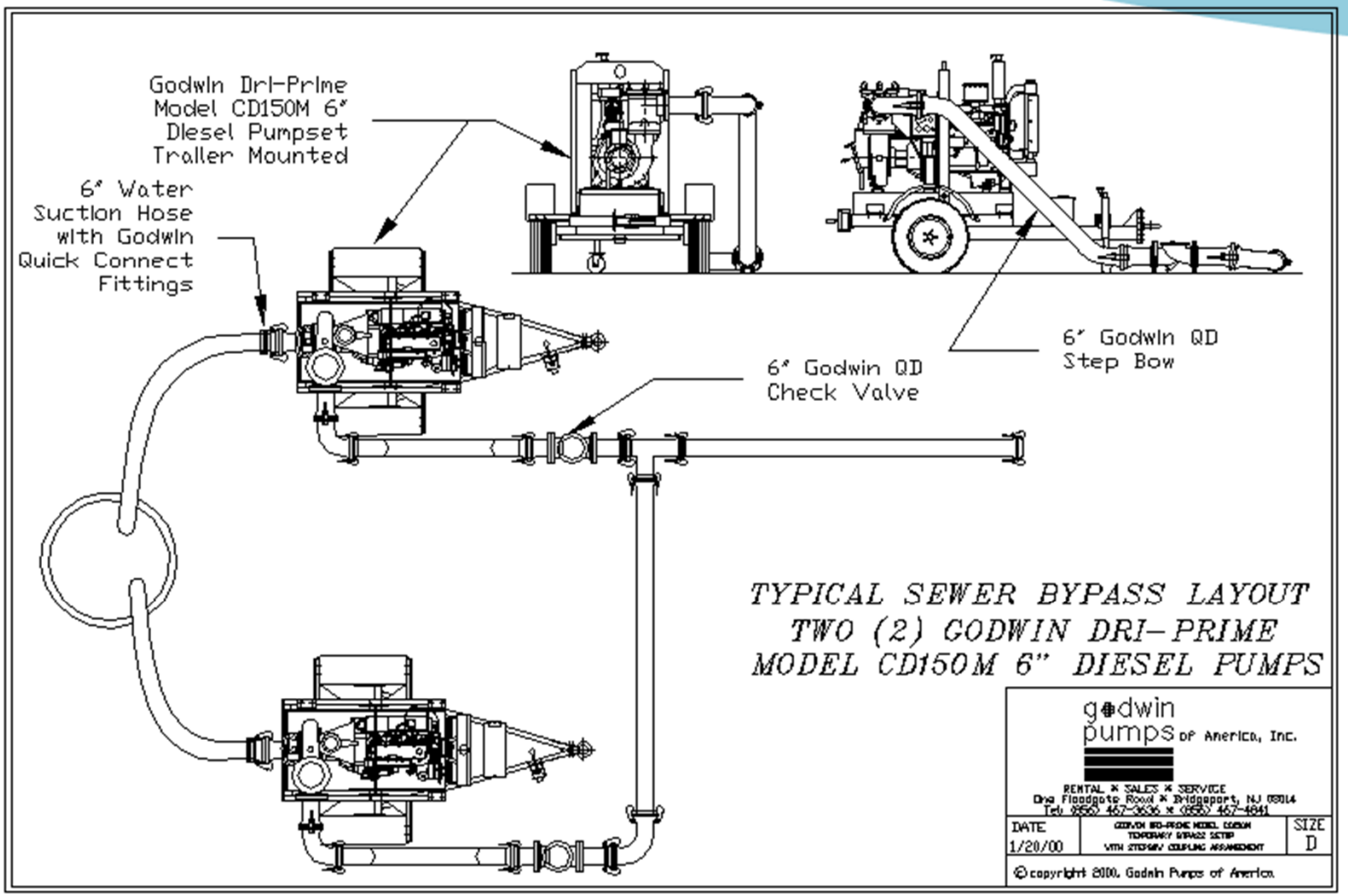
System Component: Suction/Discharge Points



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System Component: Suction/Discharge Points

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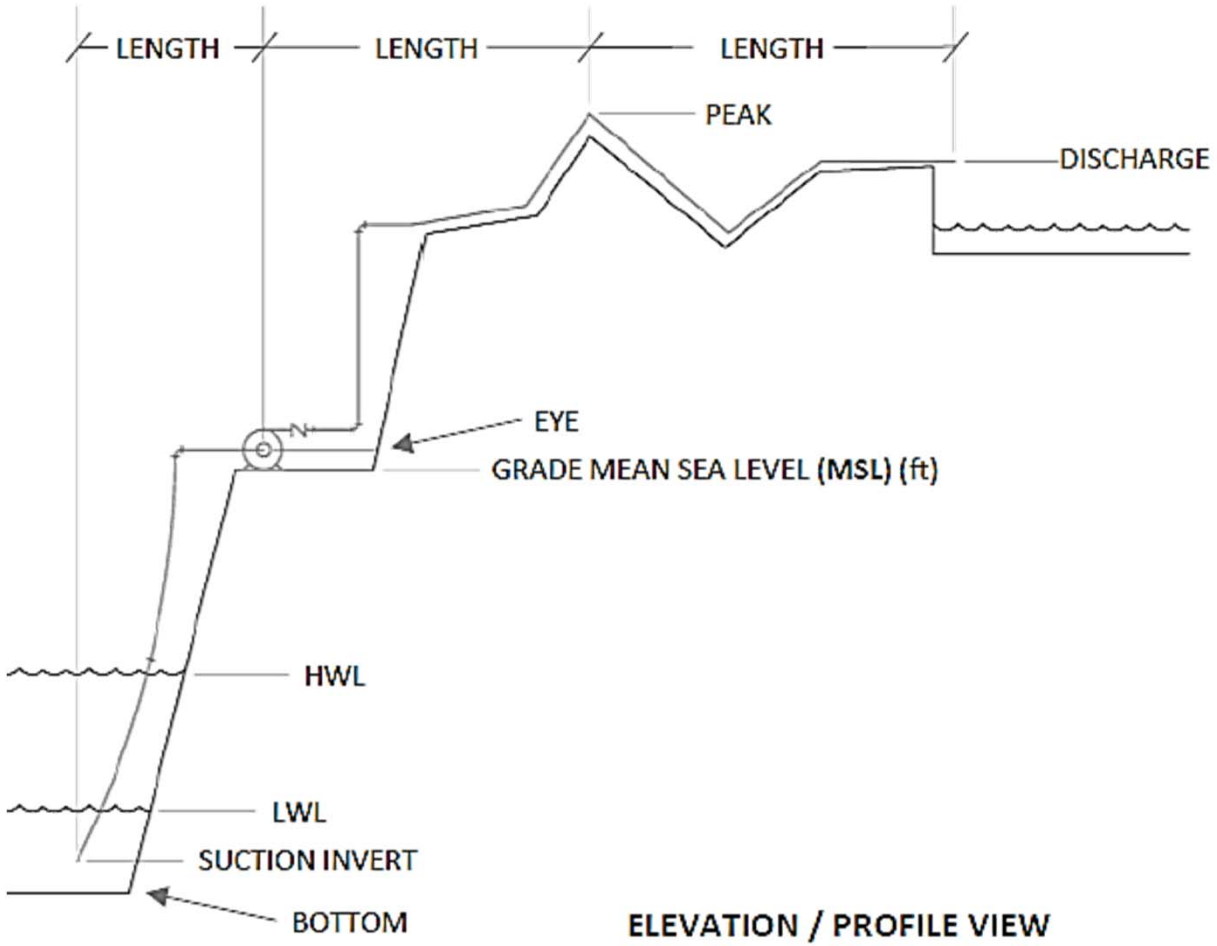
System Components: Profile Details



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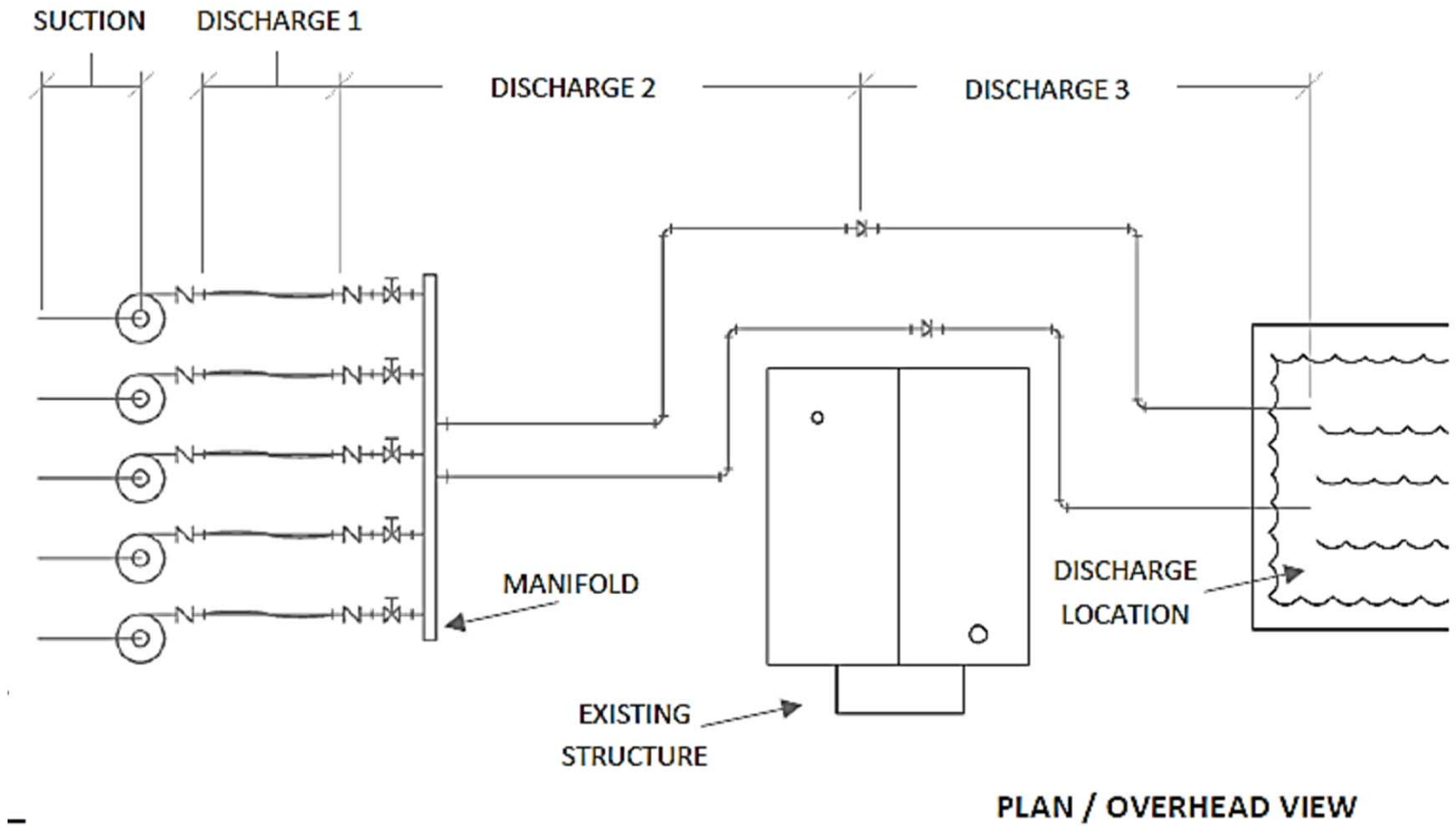
System Components: Plan Details



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System Components: Duration Impacts Cost

CALCULATED DUTY POINT		
4,200 GPM AT 160.0		
PUMP COMPARISON		
DESCRIPTION	OPTION #1	OPTION #2
PUMP MODEL:	Godwin HL250M	Goulds 16RGHC, 2 Stage
NUMBER OF PUMPS:	1	1
FLOW RATE:	4,200	4,200
TDH:	160.0	160.0
PUMP EFFICIENCY:	0.65	0.807
MOTOR EFFICIENCY (PREMIUM VS STANDARD):	1.000	1.000
SG:	1.00	1.00
ELECTRIC OPTION		
HP AT DESIGN POINT (EACH PUMP):	261.07	210.28
kW AT DESIGN POINT (EACH PUMP):	194.76	156.87
ELECTRICAL COST|DAY (TOTAL ALL PUMPS):	$467.42	$376.49
ELECTRICAL COST|YEAR (TOTAL ALL PUMPS):	$142,564.37	$114,828.80
DIESEL OPTION		
HP AT DESIGN POINT (EACH PUMP):	261.07	210.28
FUEL CONSUMPTION (GAL|HR EACH PUMP):	12.79	10.30
DIESEL COST|DAY (TOTAL ALL PUMPS):	$0.00	$0.00
DIESEL COST|YEAR (TOTAL ALL PUMPS):	$0.00	$0.00
CAPITAL INVESTMENT		
INITIAL PUMP COST (EACH):	$0.00	$0.00
INITIAL PUMP COST (TOTAL):	$0.00	$0.00
CAPITAL COST 2:	$0.00	$0.00
CAPITAL COST 3:	$0.00	$0.00
SUMMARY		
INITIAL INVESTMENT:	$0.00	$0.00
OPERATING COST PER YEAR (ELECTRIC):	$142,564.37	$114,828.80
OPERATING COST PER YEAR (DIESEL):	$0.00	$0.00

Calculate Operating Cost

- Electrical Cost ($/KW-HR
- Diesel Cost
- HP Required
- Calculates $ to Operate

Cost Comparison

- Initial Pump Cost
- Capital Cost
- EHS Cost

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System Components: EH&S

Emission Regulations

- EPA's Clean Air Act
- Tier 4 Emission required on All Non-road Diesel by 2016
- Reduce Particle Matter (PM) & Nitrogen Oxides (NOx)

Contamination Concerns

- Diesel Fuel
- Hydraulic Oils
- Wastewater Spills

Residential Concerns

- Visibility
- Noise
- Odors

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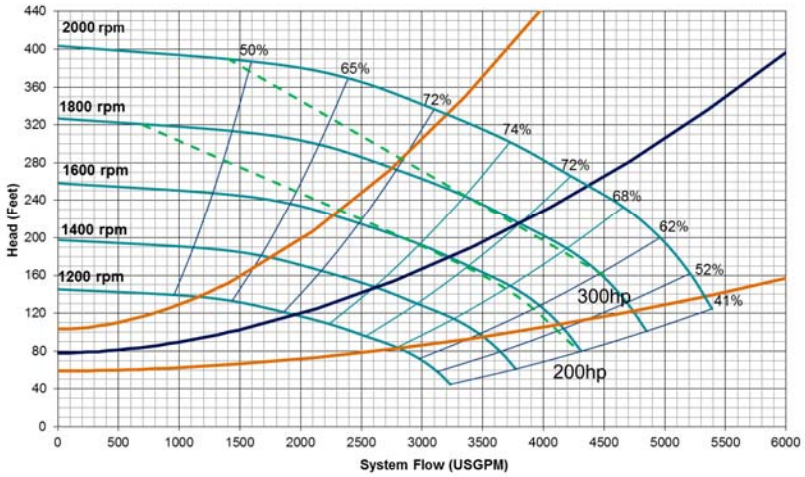
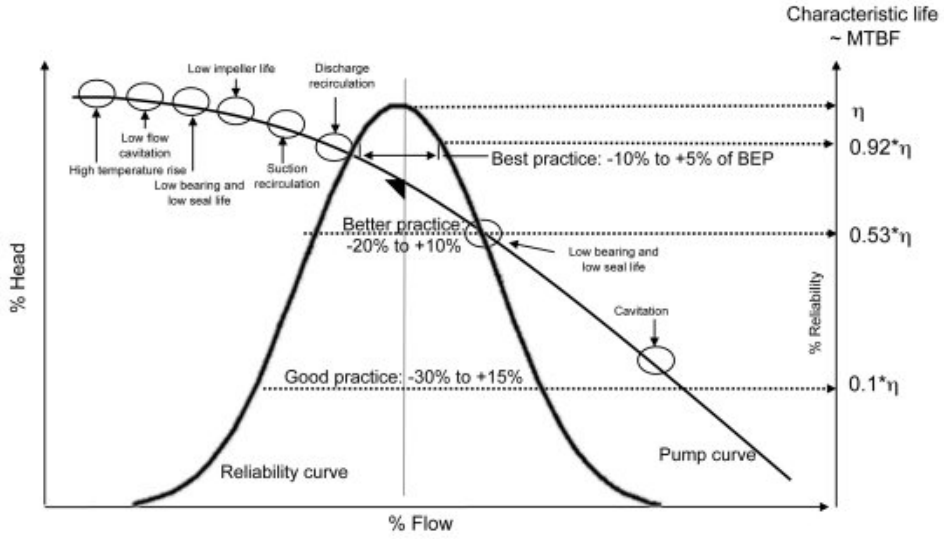
Pump Sizing By Application

Sizing Application: R & E





BEP OPERATION

- BEP is the FLOW & HEAD the Pump was Designed for
  - Minimizes Shaft Deflection & Recirculation
    - Increases Reliability & Efficiency

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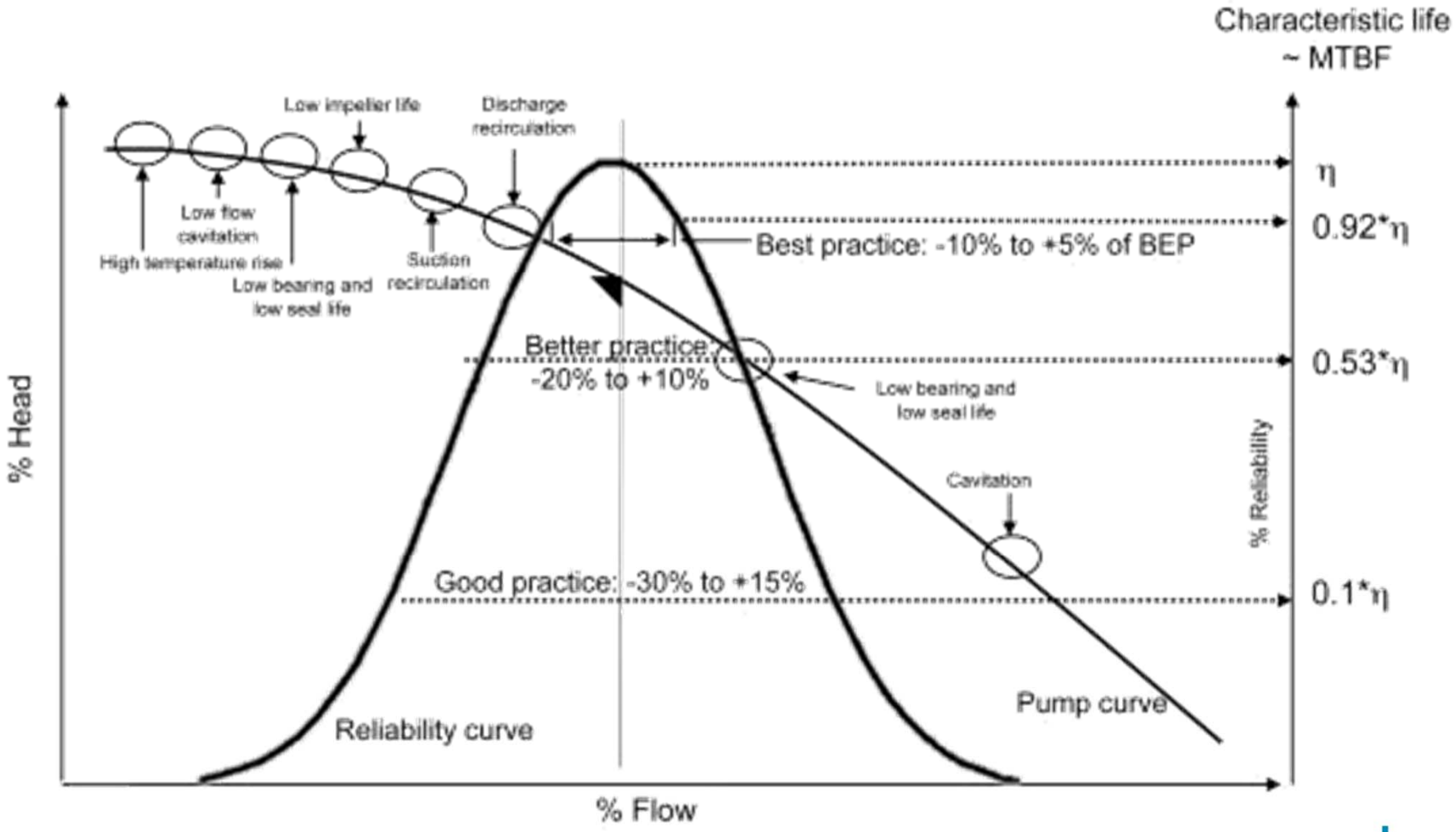
Sizing Application: R & E



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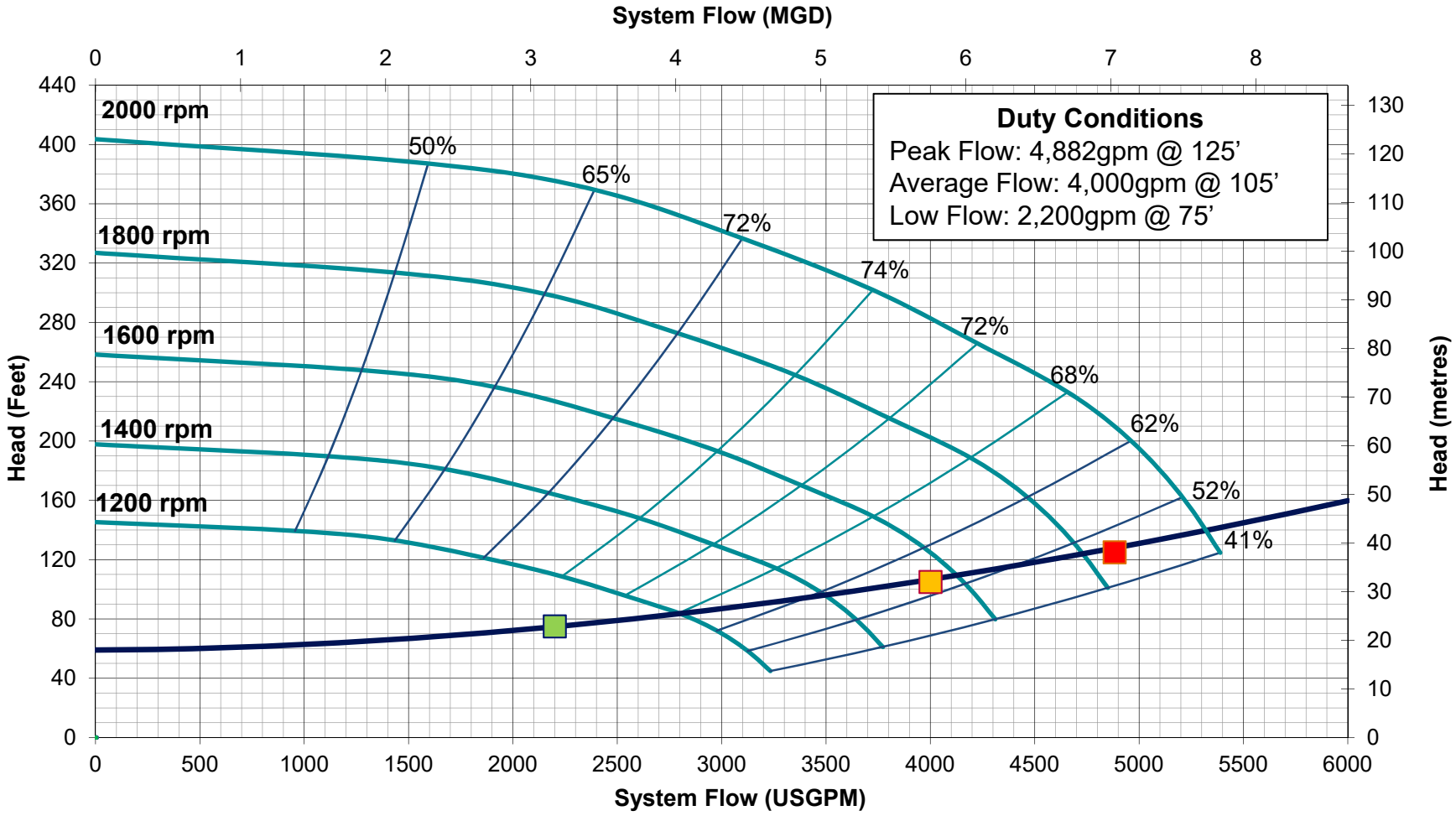
Sizing Applications

OPTION 1: ONE HL250M PUMP



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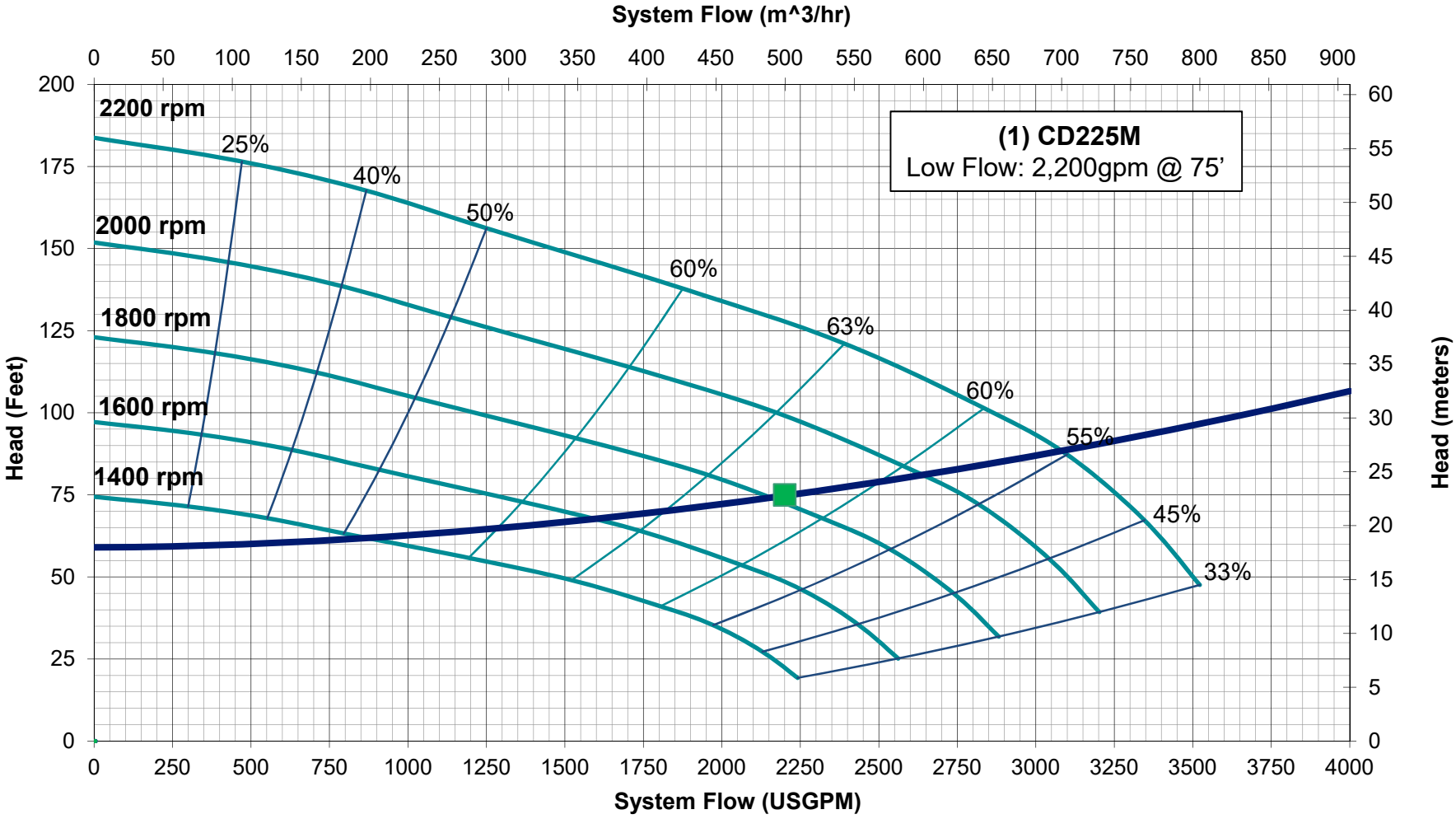
Sizing Application

OPTION 2: THREE CD225M'S – SINGLE PUMP OPERATING – LOW FLOW



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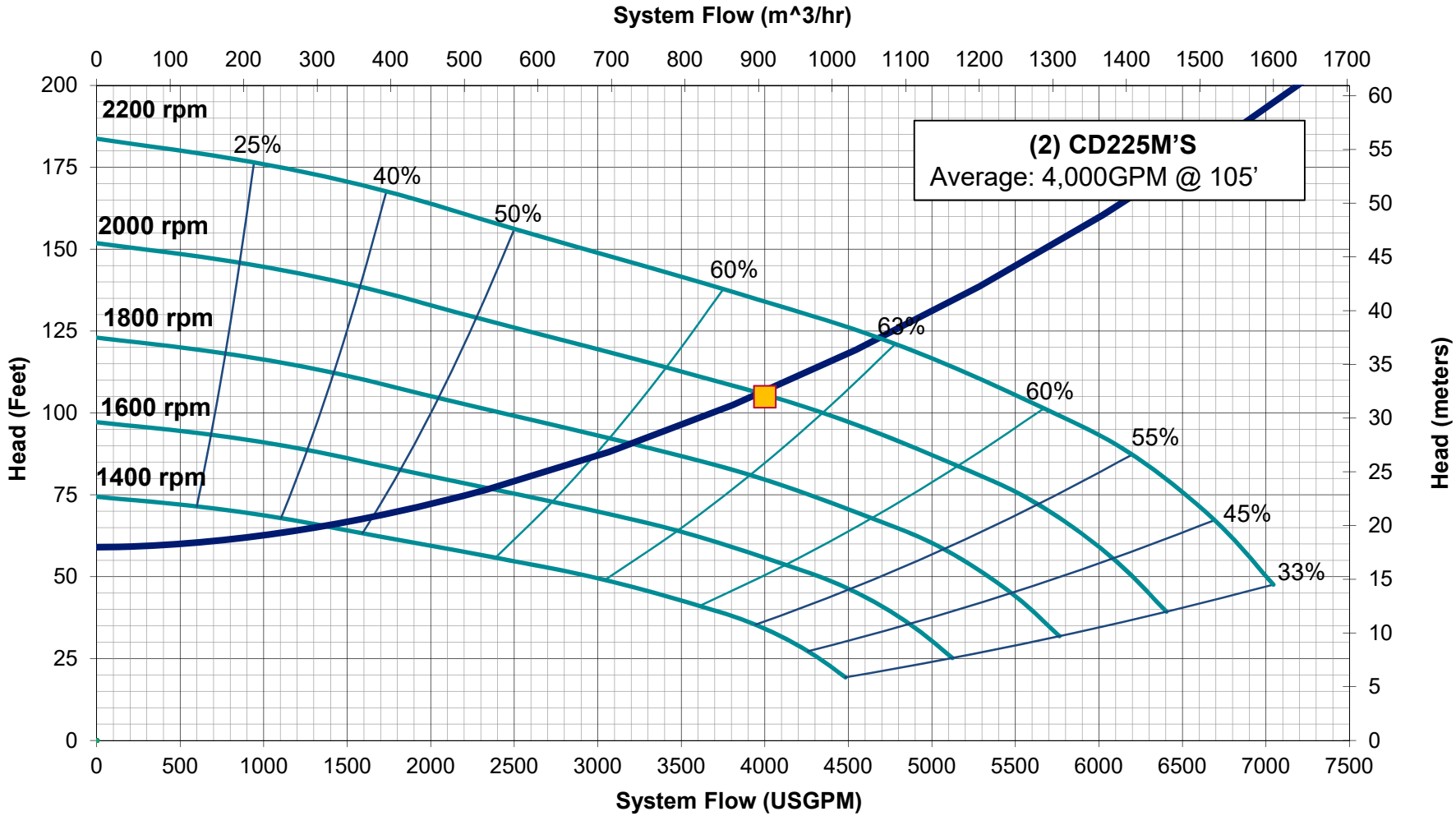
Sizing Application

GODWIN OPTION – (3) CD225M'S– TWO PUMPS OPERATING – AVG FLOW



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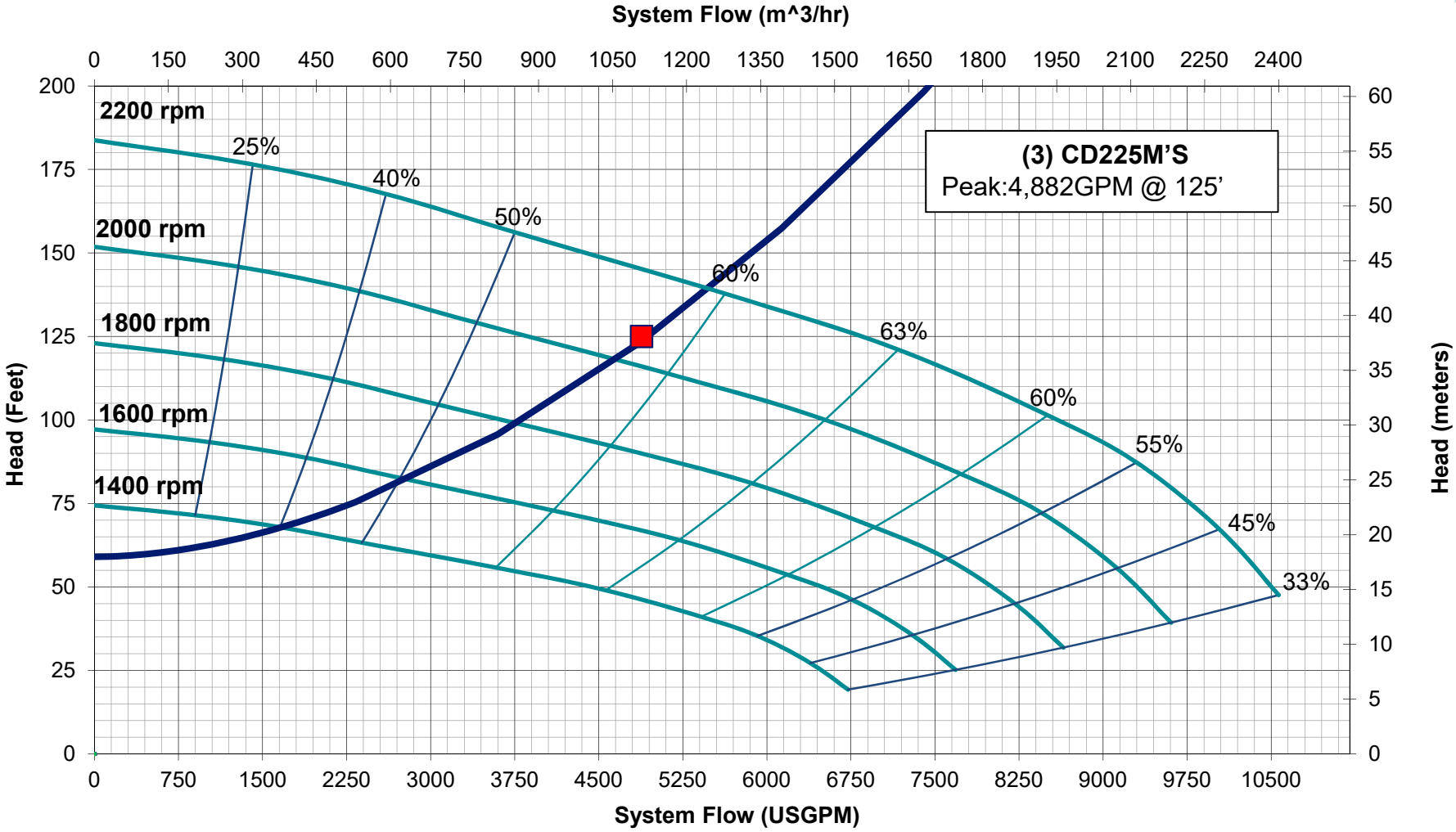
Sizing Application

GODWIN OPTION – (3) CD225M'S– THREE PUMPS OPERATING – PEAK FLOW



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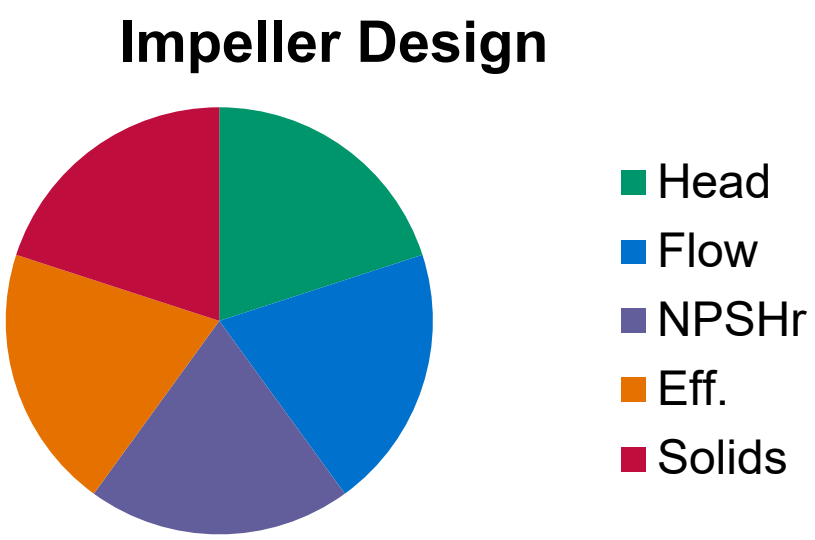
Impeller Design



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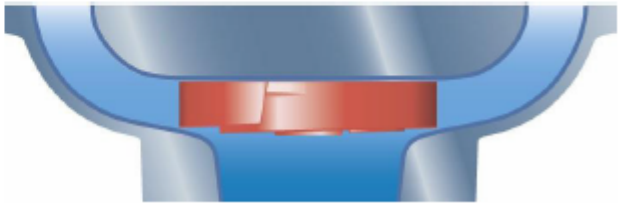
Impeller Design

2700 pumps

B

Tough pumps for dewatering

Portable, robust and reliable, they'll take on the toughest dewatering tasks anywhere you need them. B-pumps are ideal for applications in which the water or liquid contains concentrations of abrasives such as clay, sand, grit and gravel



B

- .25” Solid
- 55% Eff.

D

Pumps for solids handling

The D-pump is used mainly to pump abrasive media or low volumes at high heads. This pump features a vortex impeller, which means that the flow is produced not by the impeller but by the rapidly rotating vortex the impeller creates.
Consequently most of the particles in the liquid never come into actual contact with the impeller, thus minimizing wear. These pumps have a comparably large throughlet.

D

- 3.1” Solid
- 35% Eff.

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Risk Management

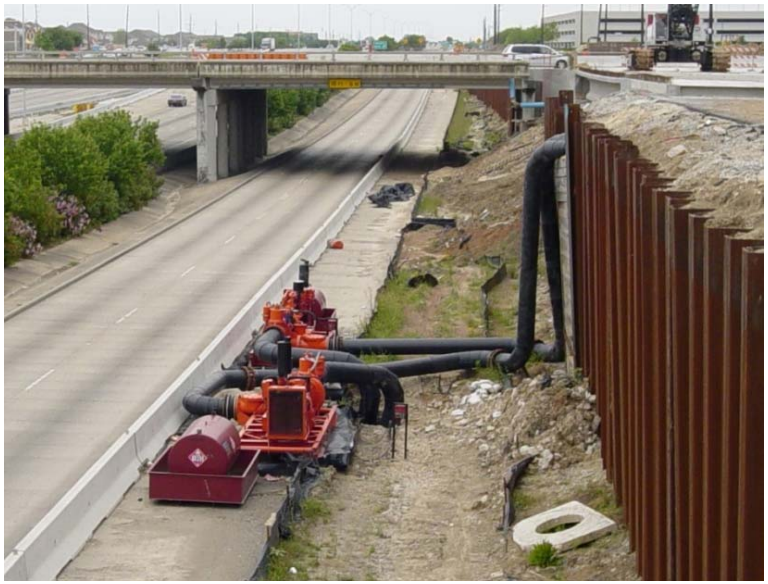
Risk Management

- Planning
- Professional Assistance
- Operation
- Noise Abatement
- Freeze Protection
- Crossing
- Misc. Components

Risk Management: Planning

Planning the Bypass

- Scheduled repair, Upgrade, Emergency
- Duration: Operational Cost
- Redundancy



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Risk Management: Professional Assistance

Techincal Proposals

- Ensure that the system will fit the project before a single pumps is shipped
- Develop tailored system designs and curves using a combination of the physical environment and system conditions
- Conduct a job-walk to determine logistics and onsite obstacles
- Complete SPECIFICATION in bid package
- Review submitted bypass plan carefully

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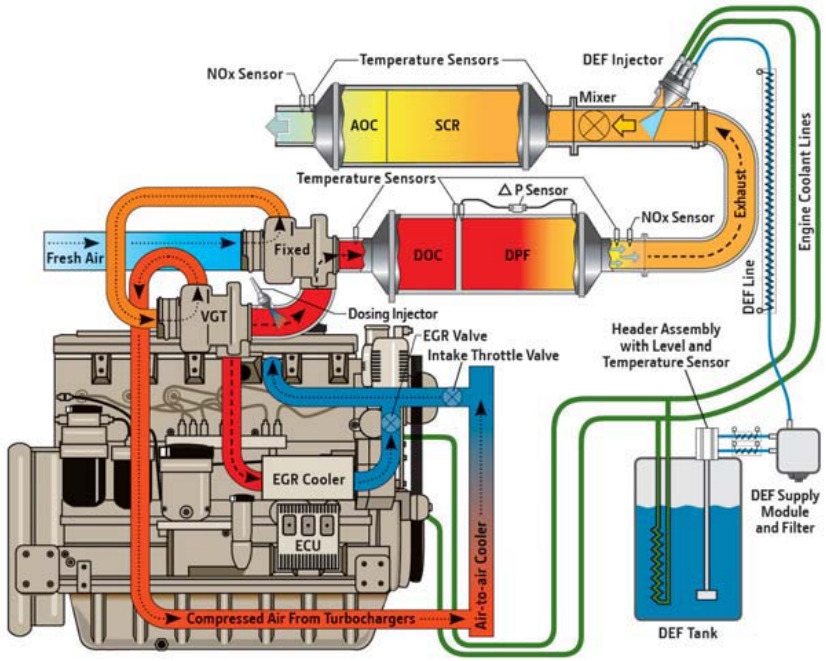
Risk Management: Operating the System

Operating Pumping Equipement

- Increase Reliability & Efficiency with Scheduled/Preventative Maintenance Plan
- Tier 4 Emission Reduction Engines Operating Range
- Fuel consumption & refueling plan



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Risk Management: Operating the System

Operating Pumping Equipement with Control Systems

- Increase Reliability & Efficiency by operating near BEP
- Tier 4 Emission Reduction Engines Operating Range
- Fuel consumption & refueling plan

Drive Controls & Transducers

ECU & Control Panel

Remote Monitors & Controls

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Risk Management: Noise Abatement

EHS Requiring Noise Reduction

- Sound attenuated cabinets reduced to 69 dB at 30’
- Electric Drive pumps w/ VFDs
- Submersible Pumps

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Risk Management: Freeze Protection

Designing System for Freezing Conditions

- Continuous Flow
- Continuous Drainage
- Schedule Running
- Trickle Charges
- Block Heater
- Heat Wrapping

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Risk Management: Crossings

Designing System for Access

- Maintain Traffic Flow w/ Roads Ramps
  - Reduce Cost
  - Reduce Disruption
- Environmental Crossing
  - Reduce Cost
  - Reduce Labor

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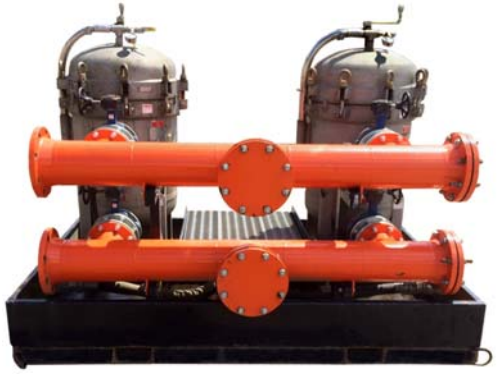
Risk Management: Misc. Components

Designing System for Safety & Reducing Cost

- HDPE & Fusion Machine
- Filters
- Sewer Plugs
- Light Towers
- Auxiliary Fuel Tanks
- Stream Box



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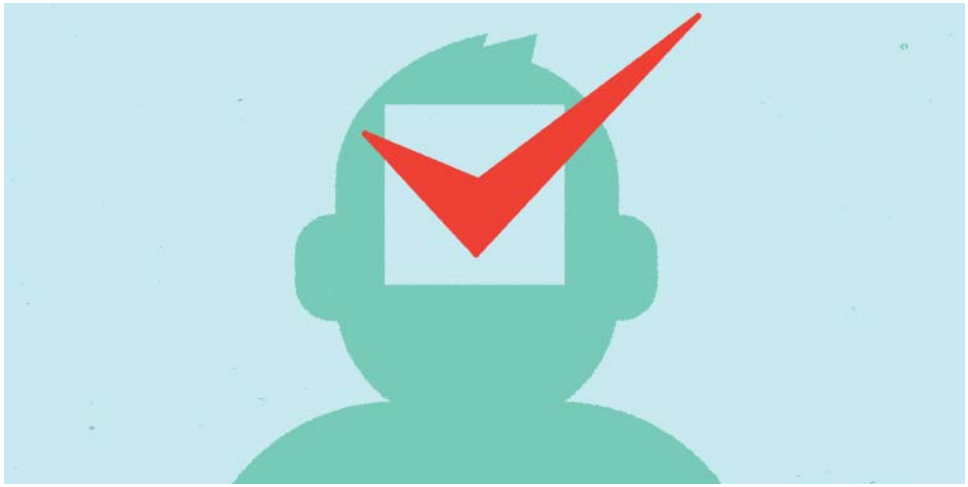
Knowledge Check



Operating a pump where on a pump curve, increases Reliability and Efficiency ?

ANSWER:

- ***BEP***

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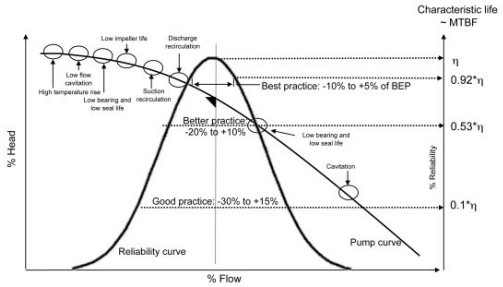
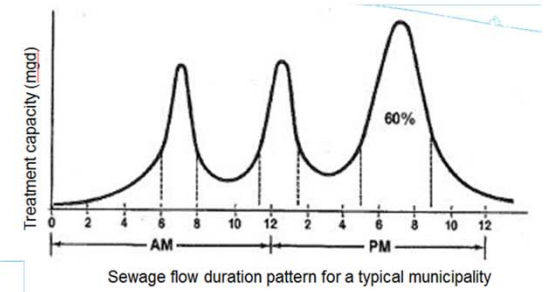
Summary

Summary

- Bypass applications require continuous, reliable pumping during Operation. ***R&E***
- Bypass applications sometimes require sophisticated solutions. ***Planning***
- Using solid engineering principles, pump systems must be sized and designed to handle project flows. ***Low, Peak, Average***
- System Components Design & Physical Conditions are key in pump selection.
  Diesel,Electric,Self-priming,Submerisble
- Detailed specifications for the bypass application are critical to the successful implementation of a bypass.





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