“Modern Collection System Solids-handling Challenges / Energy Saving Advancements”

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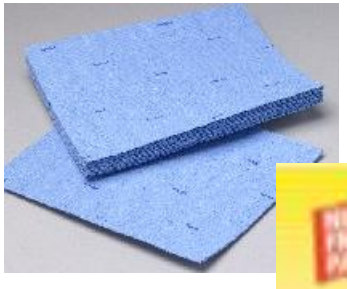
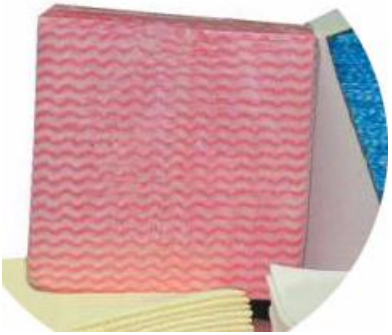
How many of you recognize photos like these?

Pumps choked with modern trash!

Modern day collection system headaches





Modern day collection system headaches

- Baby wipes
- *'Swiffer'* wiping sheets
- Plastics
- Baby diaper liners
- Toilet bowl cleaning pads and wands
- Shop rags
- *'Wettex'* spongy / cotton reinforced kitchen sheets
- Dusting sheets
- Hygiene products

Complications of ‘Modern Trash’

Concerns first raised at: *Environment 1993 Conference*…

“Flushability, Transportation and Decomposition of Non-woven Products”

- Authors related that:
  - Non-woven flushable products may not be flushable

- 1994 Fed. legislation reduced flush volume to 1.6 gal.

- Laboratory and field studies predicted difficulties in developing consumer products that met both:
  - Regulations
  - Consumer needs

INDA – '*Flushability*' Investigation

First Edition, June 2008.

Association of the Nonwoven Fabrics Industry - The European Nonwovens Association

Guidance Document for Assessing the Flushability of Nonwoven Consumer Products

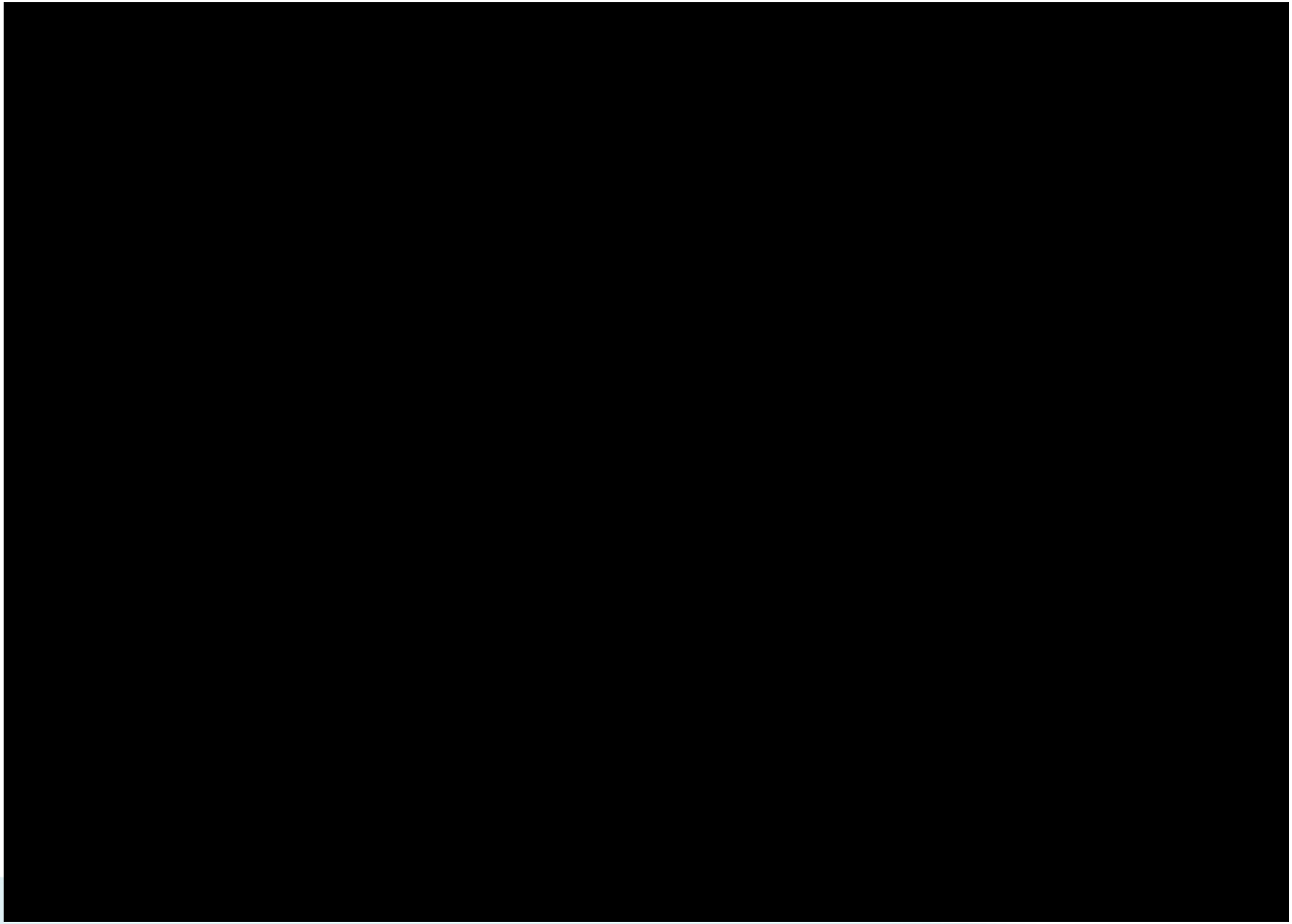
Flushability – INDA Definition

INDA: For a product to be flushable it must:

1.) Clear toilets and properly maintained drainage pipe systems under expected product usage conditions;

2.) Be compatible with existing wastewater conveyance, treatment, reuse and disposal systems; and

3.) Become unrecognizable in a reasonable period of time and be safe in the natural receiving environments.



WE&T – August, 2008 Edition

Portland Water District (PWD) – 'Awareness campaign'

Today's reality: MWWCA Membership

2010 Collection System Operations Survey

87.5% experienced problems with "flushable' products.

61.4% experienced >10 incidents with "flushable" items

84.4% clogging problems in small lift stations due to "flushables"

51.1% clogging problems in large lift stations due to "flushables"

59.6% Costs due to 'flushables' is up to $1,000 per incident

12.8% Costs due to 'flushables' of up to $2,000 per incident

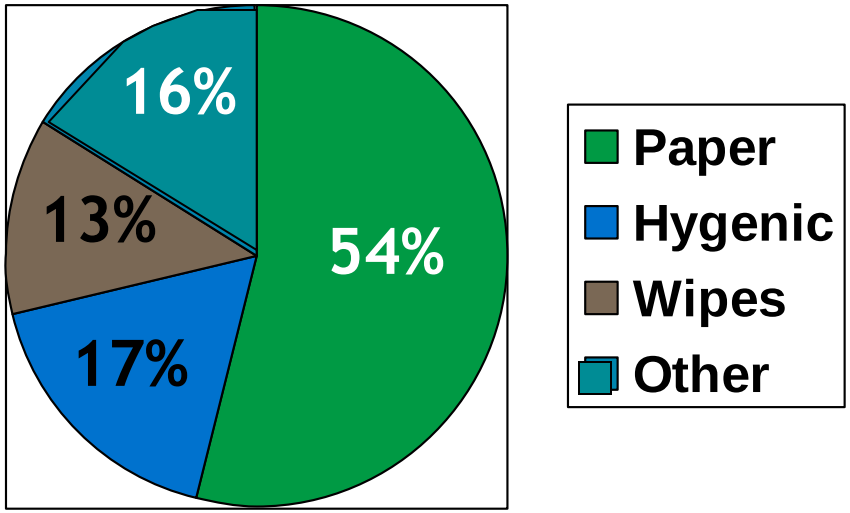
88.9% Report that problems with "flushables" are increasing

Case Study:
Town of Moraga, Costra County, CA

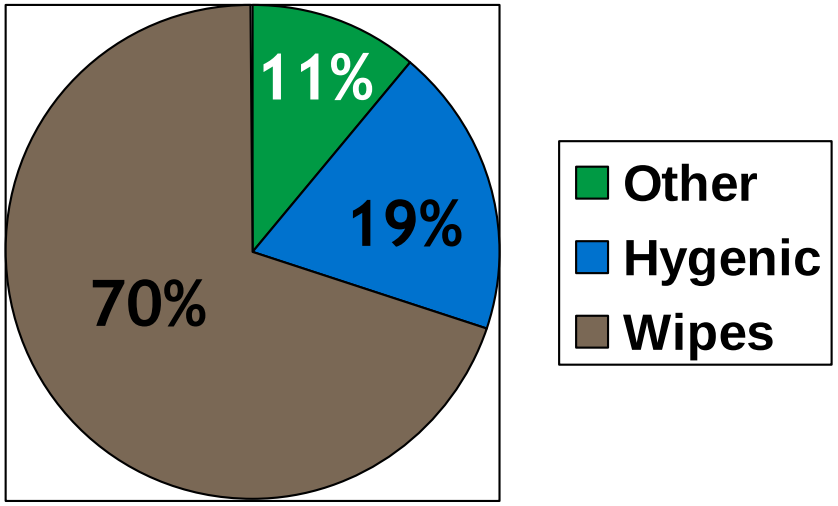
- Significant number of pump clog incidents per month
- 3” bar screen replaced with 1.5” bar screen
- Case study results:
  - Increased frequency of bar screen cleaning
  - Bar screen blinding by ‘pan-caking’ of brown towel sheets
  - While reduced, pumps each still clogged 3-4 times /mo

Town of Moraga, Costra County, CA
Recorded wastewater trash distribution

Bar screen capture



Pump clog components



Case Study:
Town of Moraga, Costra County, CA

Pump clogs mainly consisted of:

- Long, twisted, knotted, rope-like formations
  - Strong non-woven materials
  - Long fibrous products:
    - Personal hygiene products
    - Household cleaning wipes
    - Personal wipes

Town of Moraga, Costra County, CA
Typical pump clog sample

Pump clog debris

Decomposed debris clog

Modern wastewater:
Wastewater pumping is a tough application!

Innovative technology in sewage pump design

Q: How many of you believe that today, the most effective solids-handling pump…

Is one that can pass a 3-inch diameter solid?

Innovative technology in sewage pump design

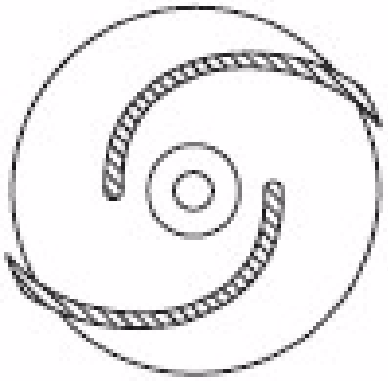
For the sewage historians in the room…

Q: *Where and when did the requirement for wastewater impellers having a 3” throughlet originate?*

Solids-handling pumps – A history lesson

A: Mr. A. Baldwin Wood – 1915

- Assistant Superintendent, New Orleans S & WB
- *"Father of the 'non-clog' wastewater pump"* developed the Wood "Trash Pump"



Typical 2-channel solids-handling impeller

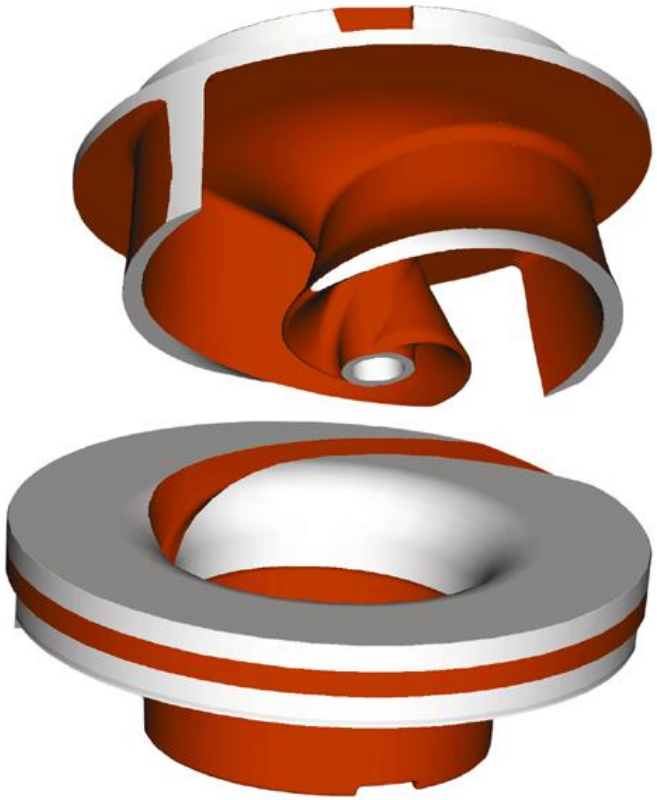
Solids-handling pumps – A history lesson

- Wood theorized that a better wastewater pump would result if an impeller had vanes with blunt leading edges and large throughlets

- His intuitive specifications resulted:
  - Minimum sized conveying line: 4-inch
  - Minimum throughlet size: 3-inch

Today's Collection Systems Challenge:
Keeping sewage pumps operating

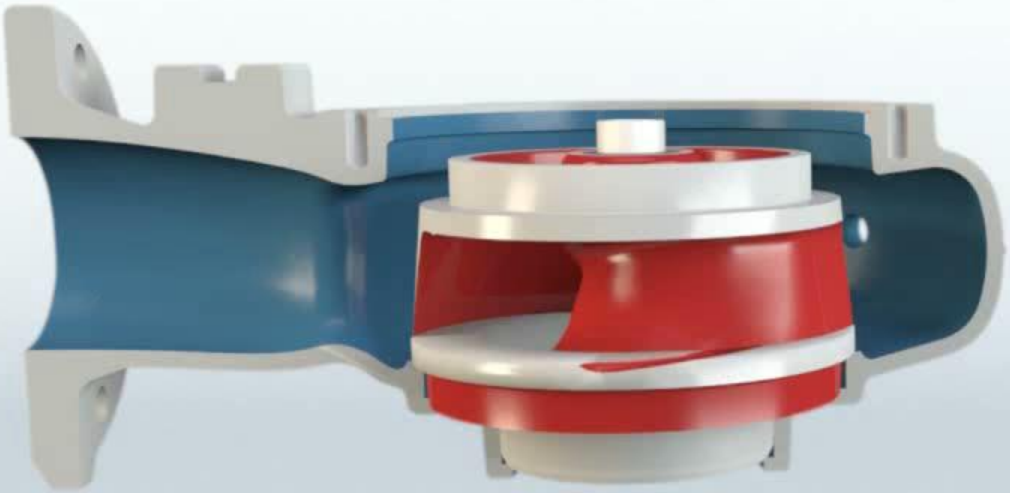
Innovative technology
In solids-handling pump design

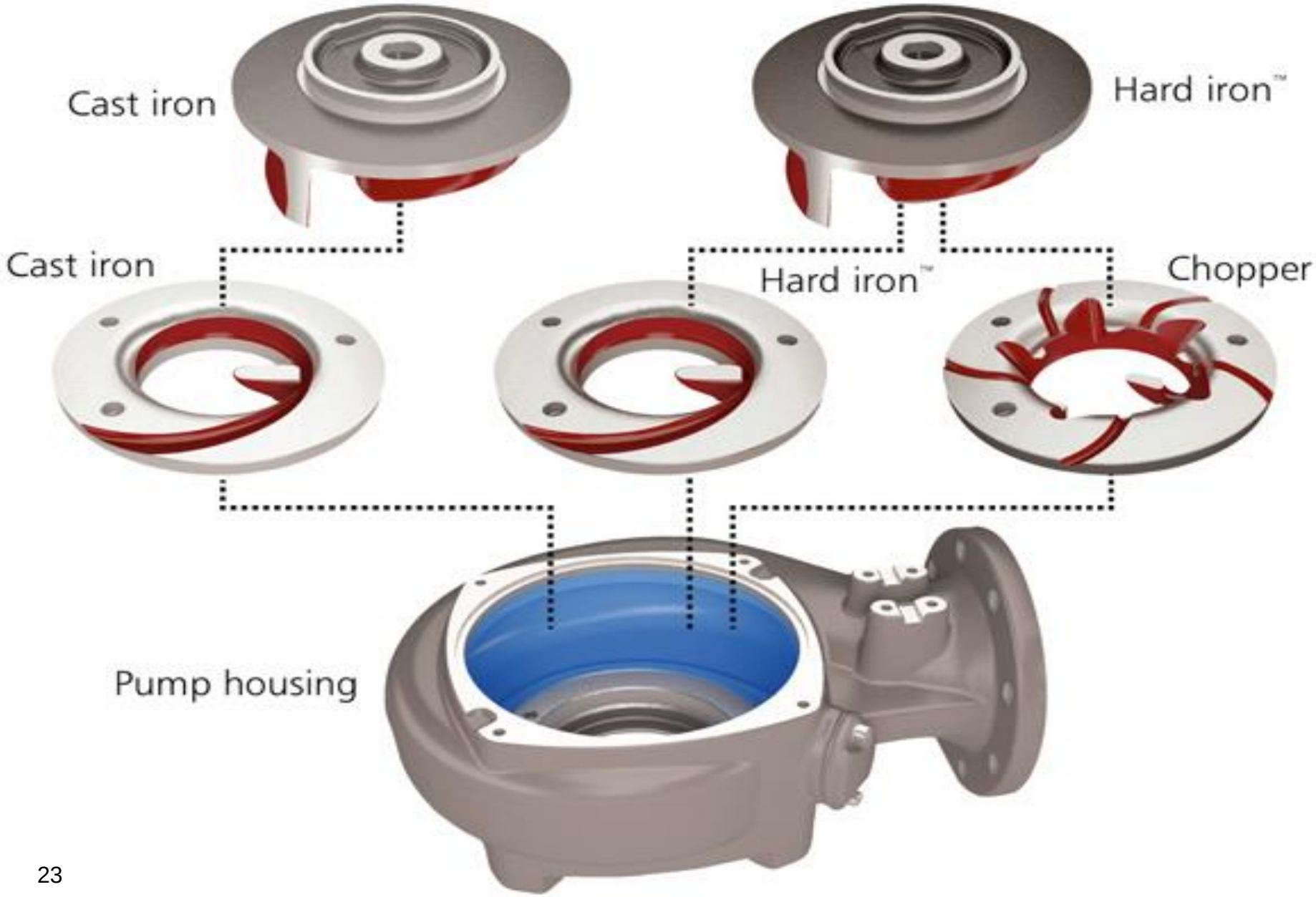


Semi-open, non-clog, multi-vane, self-cleaning impeller with horizontal back-swept vanes

Vane edges are wiped clean at the interface of the relief-groove during each rotation

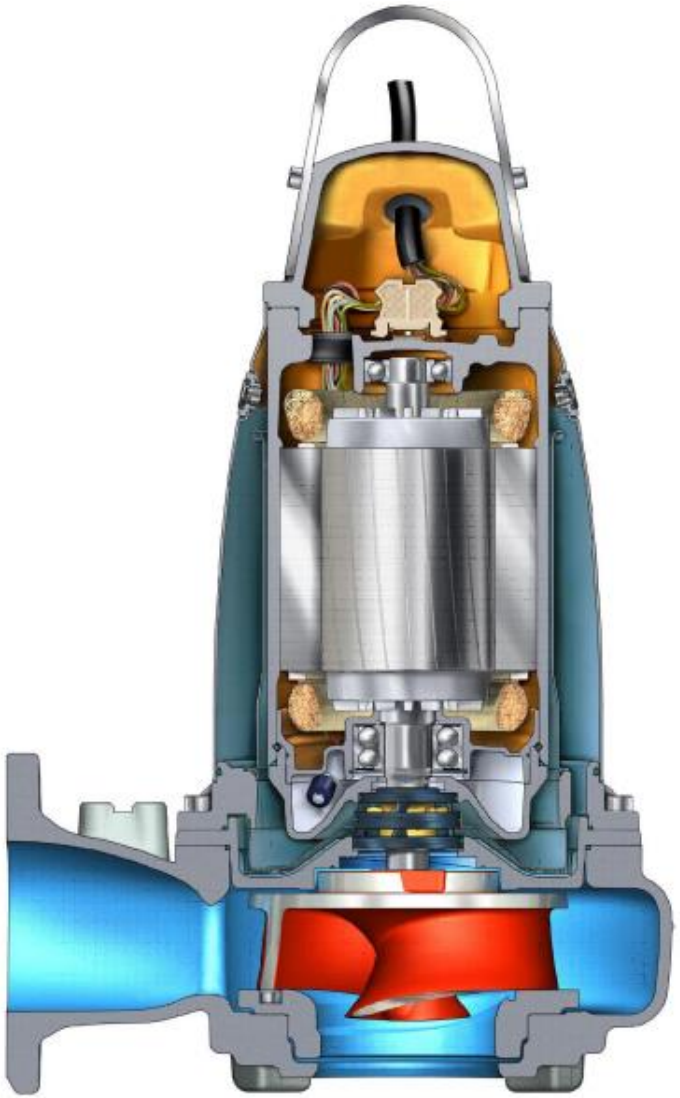
N-Technology




Cast iron
Hard iron™
Cast iron
Hard iron™
Chopper
Pump housing

Innovative technology

Self-cleaning, N-Hydraulics providing sustained high hydraulic efficiency



Innovative technology
In solids-handling pump design

What Is Clogging Anyway?

Innovative technology

In solids-handling pump design

These pumps are clogged!

Innovative technology
In solids-handling pump design

What Is Clogging Anyway?

- Clogging is defined as “a partial or full blockage of the pump resulting in from reduced to non-existent flow”.
- Most clogging instances result in limited flow reductions (i.e.) *the pump will still deliver some flow, but not very efficiently.*
- A. Baldwin Wood’s *‘non-clog’* pump was developed to minimize the risk of complete blockage.

Innovative technology
In solids-handling pump design

Both laboratory tests and field installations alike show that sewage pump clogging is mainly due to:

1. Rags and stringy materials that get stuck on the impeller vane edge or in the eye of the impeller.
2. Jamming of the impeller / wear ring interface.
3. Full plugging of the volute (Vortex pumps)

Innovative technology
In solids-handling pump design

Laboratory pump clog test rig

Innovative technology
In solids-handling pump design

Laboratory test protocol developed...

- 10” x 10” test objects were fed into each pump
  - One at a time, at 15 sec. intervals.
- Test objects: 10 mil plastic strips, ‘*Wettex*’ dish cloths and reinforced textile rags, 50 pcs of each.
- Tests were performed at flows of:
  - 900 gpm and 1,250 gpm
- All test program pumps had 4” discharge

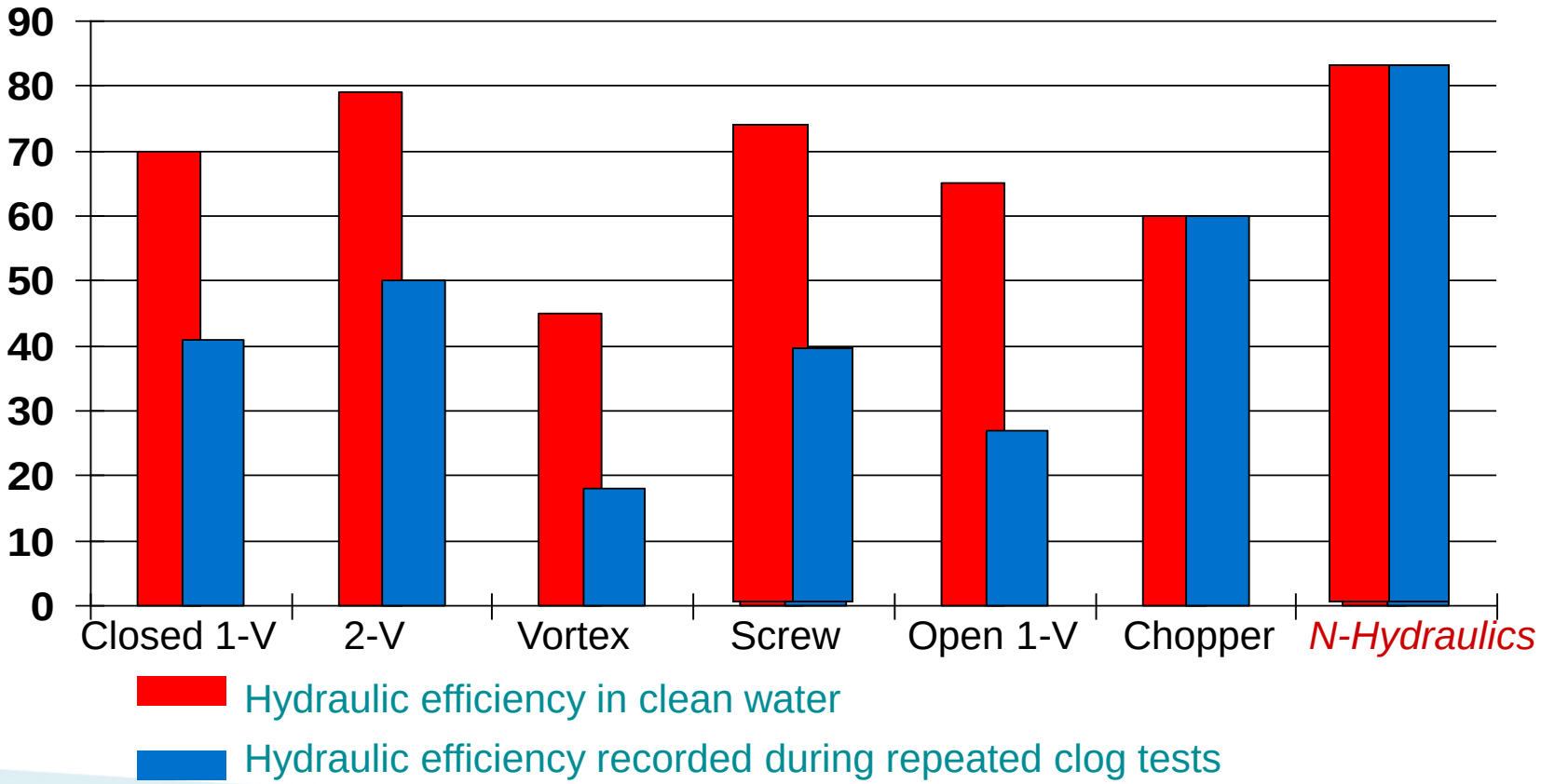
Innovative technology

In solids-handling pump design

Laboratory test objects

Innovative technology
In solids-handling pump design

Pump efficiency comparison by impeller type



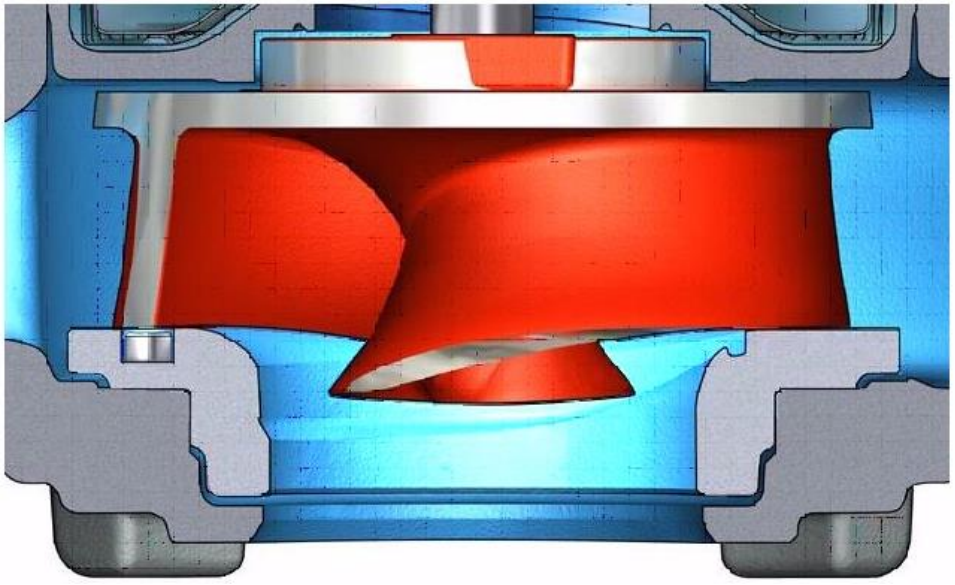
Innovative technology
In solids-handling pump design

Clog test conclusions

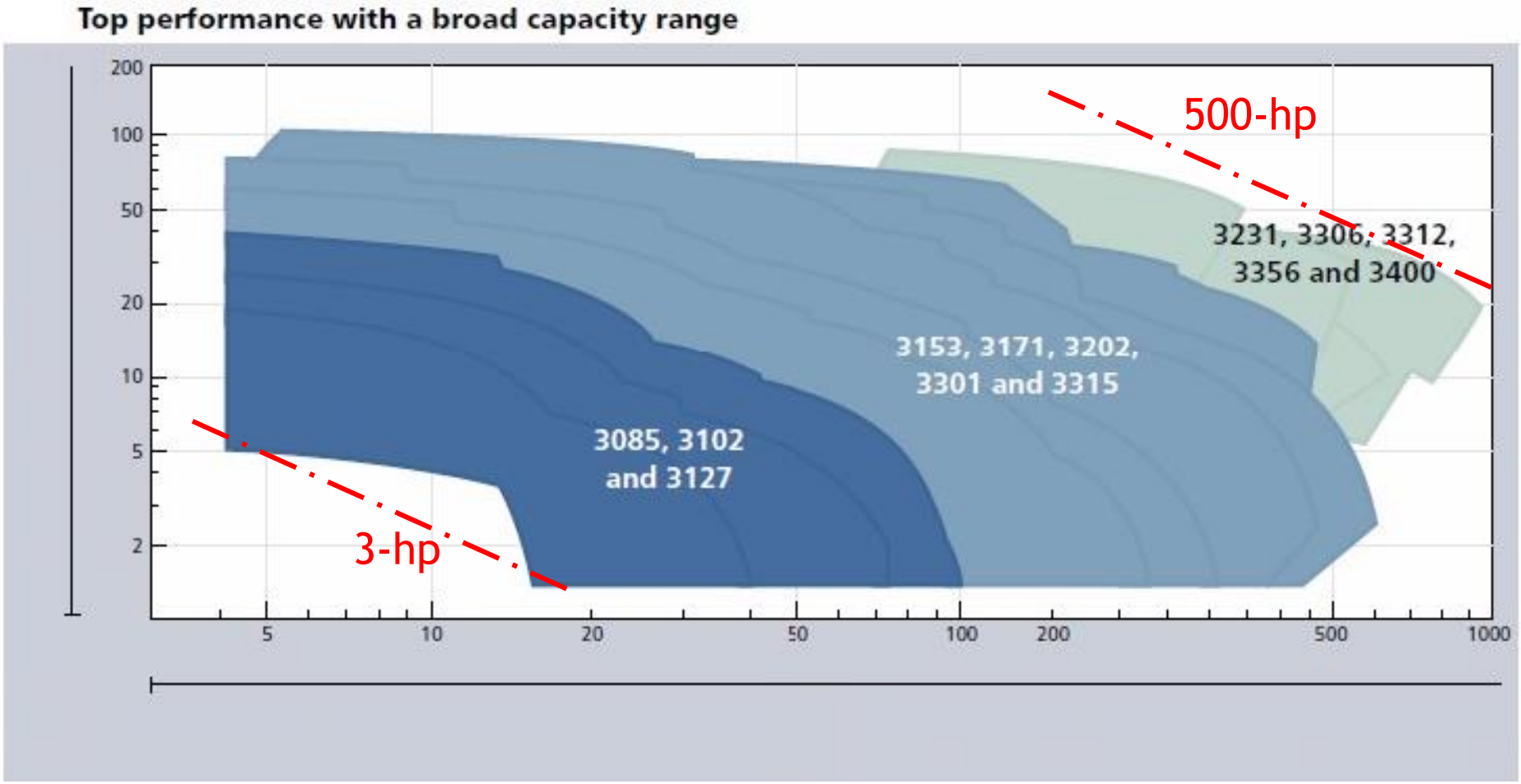
- *Impeller design is much more important than throughlet size to prevent clogging.*
- *Impeller vane leading edge angle is very important.*
- *The maintaining of cleanliness of the leading edge of the impeller vane(s) is of utmost importance.*

Innovative technology
In solids-handling pump design

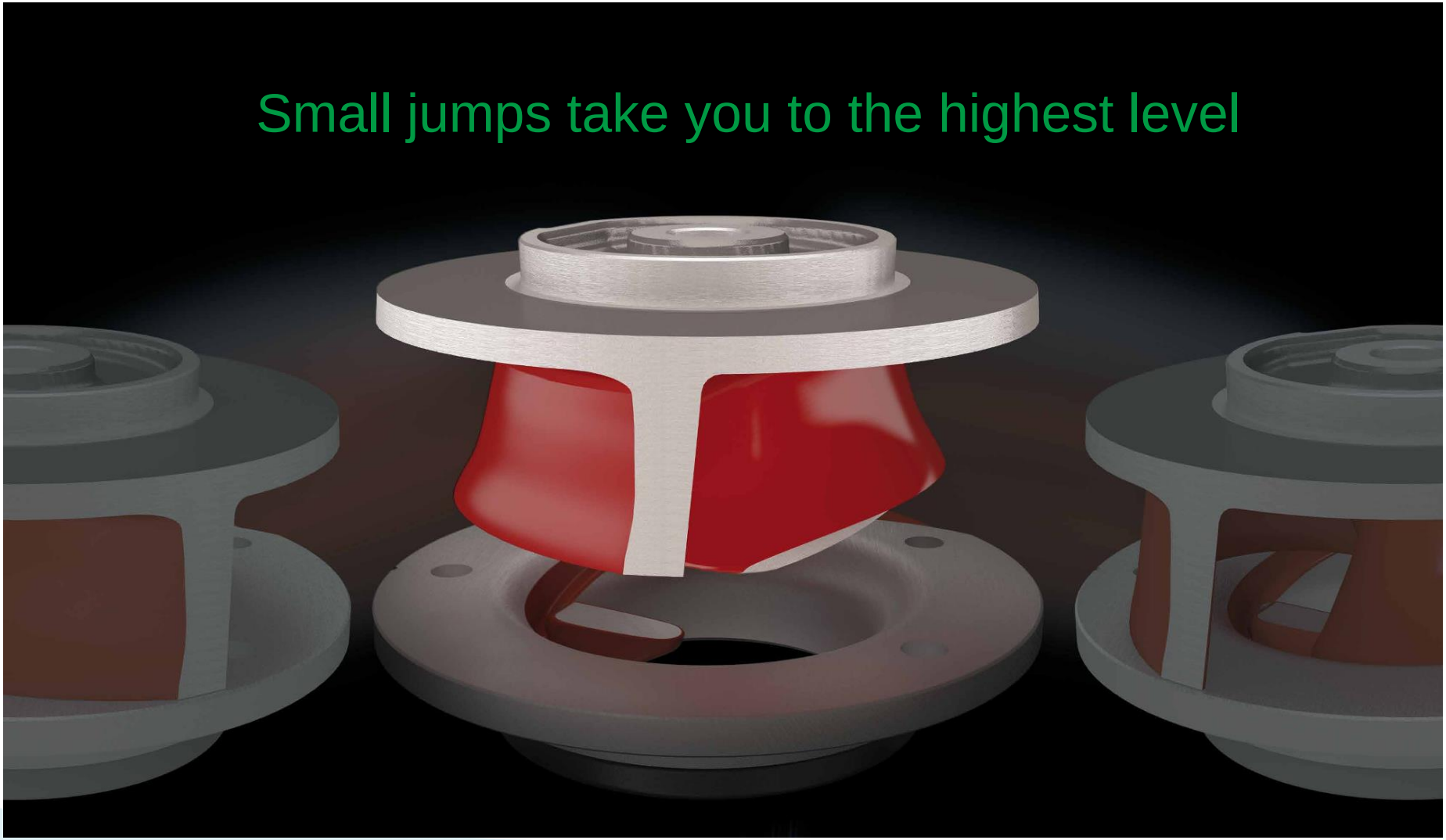
Since 2000, more than 70,000 Flygt N-Pumps have been sold and are successfully operating in the U.S. pumping raw, unscreened sewage, wastewater and sludge.



N-Pump Performance Field



The Adaptive Flygt® N-impeller



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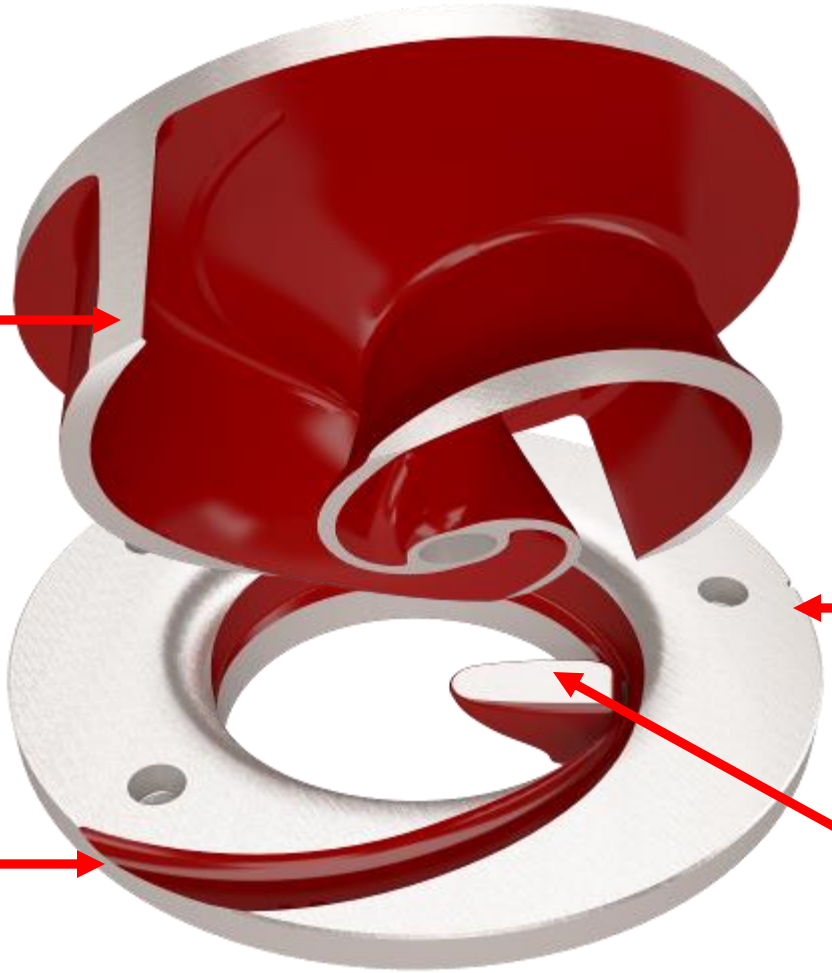


The solution: The Flygt Adaptive™ N-impeller

3.0-hp through 10-hp

N-Hydraulics* chosen as *2011
WEF Innovative Technology Award Winning Product

1. The N Technology self-cleaning concept

2. The Adaptive functionality

Santa Fe, NM WWTP: N-3085

Clarifier scum pit

- Centrifugal pump clogged daily
- Chopper pump clogged several times weekly
- Adaptive-N has not clogged once since 11/21/08

Berkley Co., SC: P.S. #015

Existing submersible pumps clog frequently

- N-3102.160 / 5-hp installed 7-Jan, 2010… No clogs
- Original pump continues to clog
- Energy study by owner is now underway

Consortium for Energy Efficiency

Industrial Programs

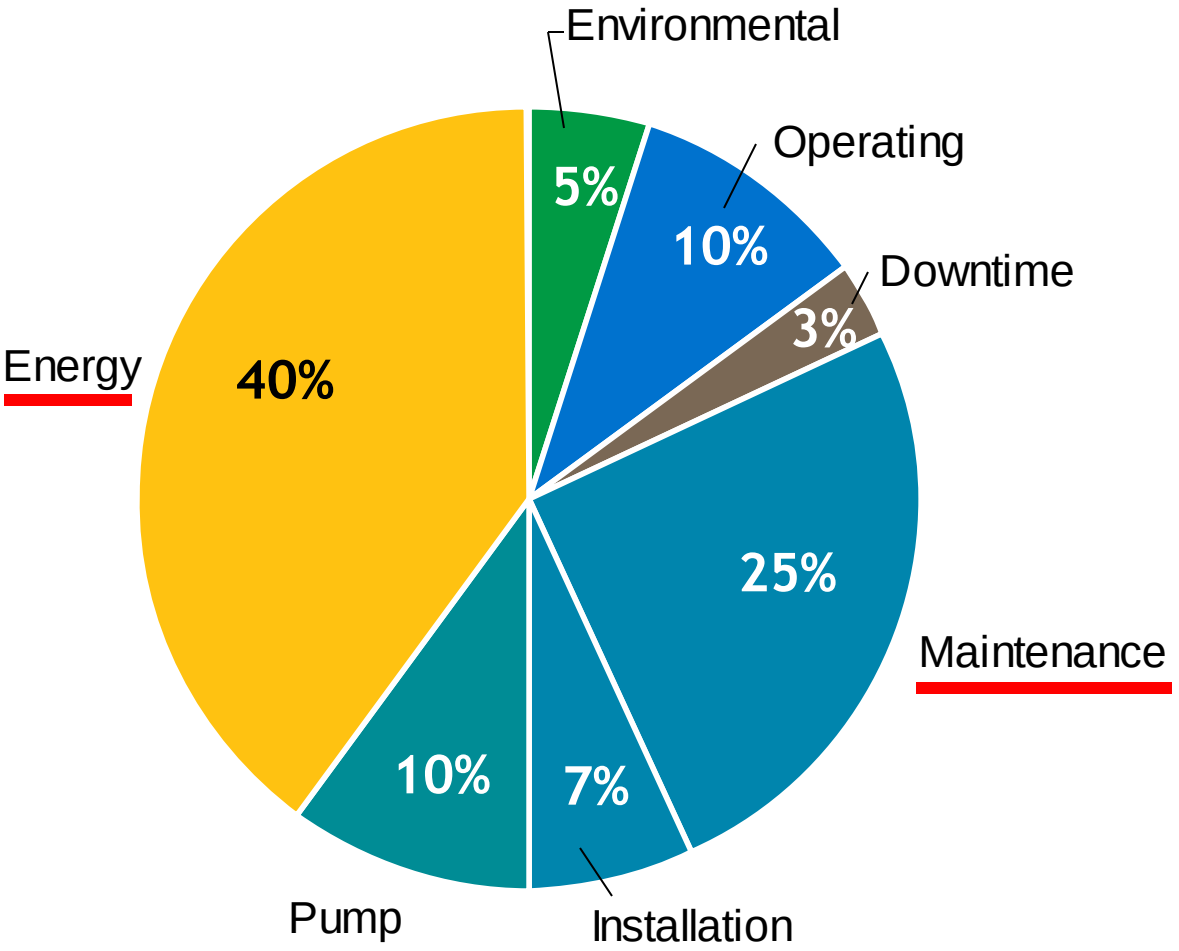
National Municipal Water and Wastewater Facility Initiative

Municipal water and wastewater systems

- Consumes 4% of all U.S. energy
- 52,000 water systems produce 51Bn gallons of water per day
- 16,320 wastewater treatment facilities treat 34.8Bn gallons per day
- Greatest energy consumer in water treatment: **Pumps**
- Greatest energy consumers in wastewater treatment are:
  - 1. Blowers
  - **2. Pumps**
  - 3. Sludge handling equipment

Energy savings:

Typical life cycle cost for a pumping system (Source: EPA)



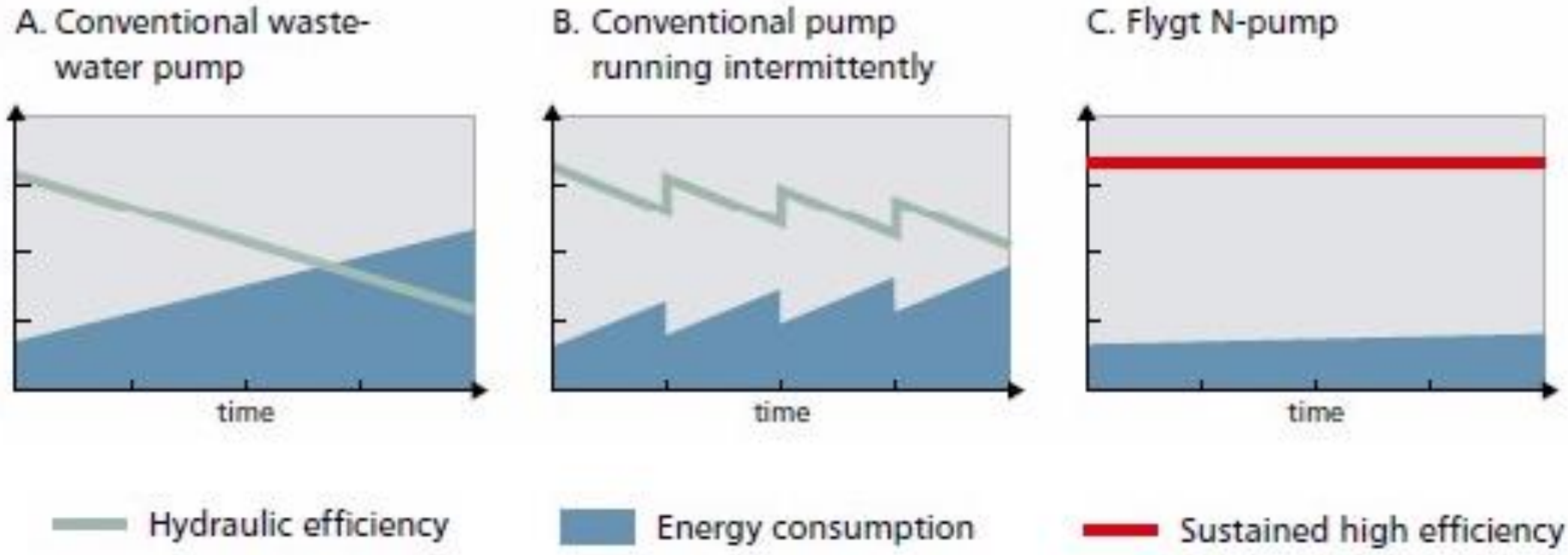
Budget saving project overviews

Rockport, TX

- (2) 25-hp self priming pumps replaced with…
- (2) 10-hp Flygt N-pumps
- Results:
  - Monthly energy charges reduced by 40%
  - Utility demand charges eliminated
  - Run-time cut in half!

Vancouver, WA

- (4) 40-hp submersible pumps had frequent fouling and clogging
- (4) Flygt N-3171 / 25hp pumps installed
  - $8,000 in maintenance savings – no more pulling of pumps
  - $3,000 in operational savings / energy savings


A. Conventional waste-water pump
B. Conventional pump running intermittently
C. Flygt N-pump
time
time
time
Hydraulic efficiency
Energy consumption
Sustained high efficiency

SAVE AT LEAST 25%

ON ENERGY CONSUMPTION WITH ANY FLYGT N-PUMP GUARANTEED

Save even more: Switch to Flygt N-Pumps and you may qualify for Green Stimulus funds from the US Government.

Municipalities across America are saving big money by replacing their existing pumps with new Flygt N-Pumps. They're also increasing productivity and ensuring high efficiency – because the self-cleaning Flygt N-Pump makes clogging and breakdowns all but obsolete. And since our N-Pumps are guaranteed to save at least 25% on energy consumption, you might also qualify for Green Stimulus funds as specified by the Federal government's American Recovery and Reinvestment Act (ARRA) of 2009. In some states, local utilities have received grants that provide Flygt N-Pumps for free! Check with your state officials and maximize your benefits. Save big. Save now. Switch to the Flygt N-Pump. For full details, call 203-380-4826 or visit us online at www.us.ittwww.com

Recent energy saving project

City of Andalusia, AL

- U.S. Department of Energy Block Grant
  - Alabama Dept. of Economics and Community Affairs
- Project specification: 25% energy savings guarantee the responsibility of the contractor
  - Failure to achieve: Reimburse $240,000 ADECE funding
- **Central Lift Station**
  - (3) N-3301 / 85-hp and (2) N-3202 / 45-hp pumps installed
    - 56.1% Energy savings recorded by engineer
- **Riverside WWTP**
  - (3) N-3202 / 45-hp pumps installed
    - 48.1% Energy savings recorded by engineer

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