6th Annual Practical Short Course

WATER Issues & Technologies:
Process Water, Wastewater, and Desalination

College Station, Texas

(August 8-10, 2010)

Separation Sciences Program
Food Protein R&D Center (FPRDC)
Texas Engineering Experiment Station (TEES)
Global Petroleum Research Institute (GPRI)
Texas A&M University System

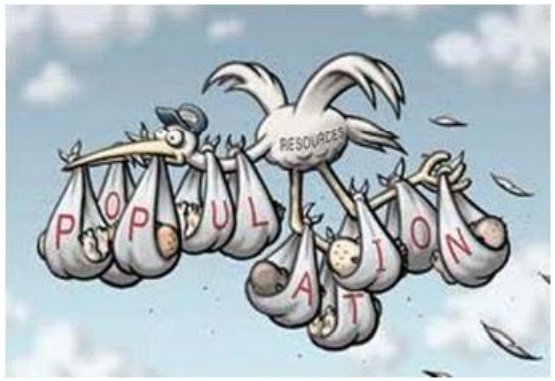
Presented by
William O. Irvine, MBA, P.E.
Engineering Fluid Solutions, LLC

Presentation Outline

- Problem Identification
- Water Resources
- Water Use
- Population Growth
- Industrial Process Treatments
  - Environmental Impact
  - Cost of Production
- Sustainability Initiatives
- Future Directions

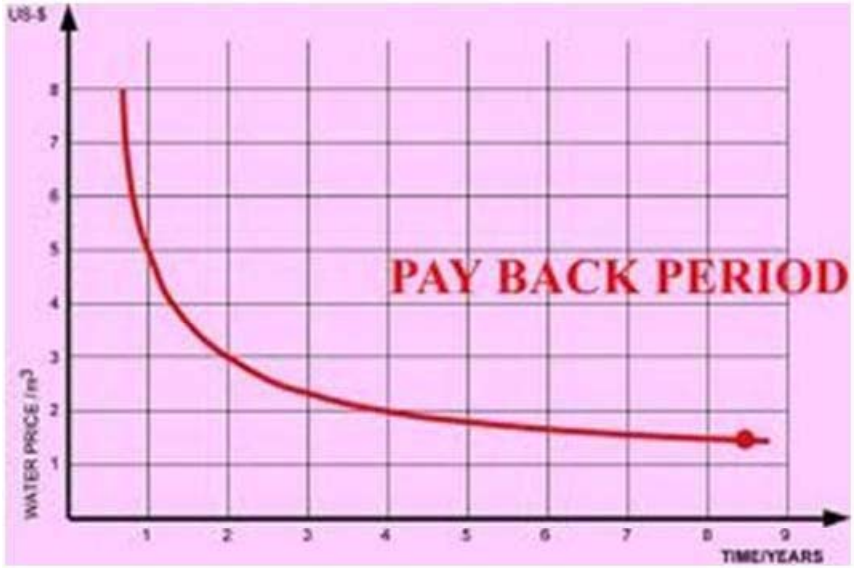
PROBLEM IDENTIFICATION:

1. Increasing population competing for limited water resources

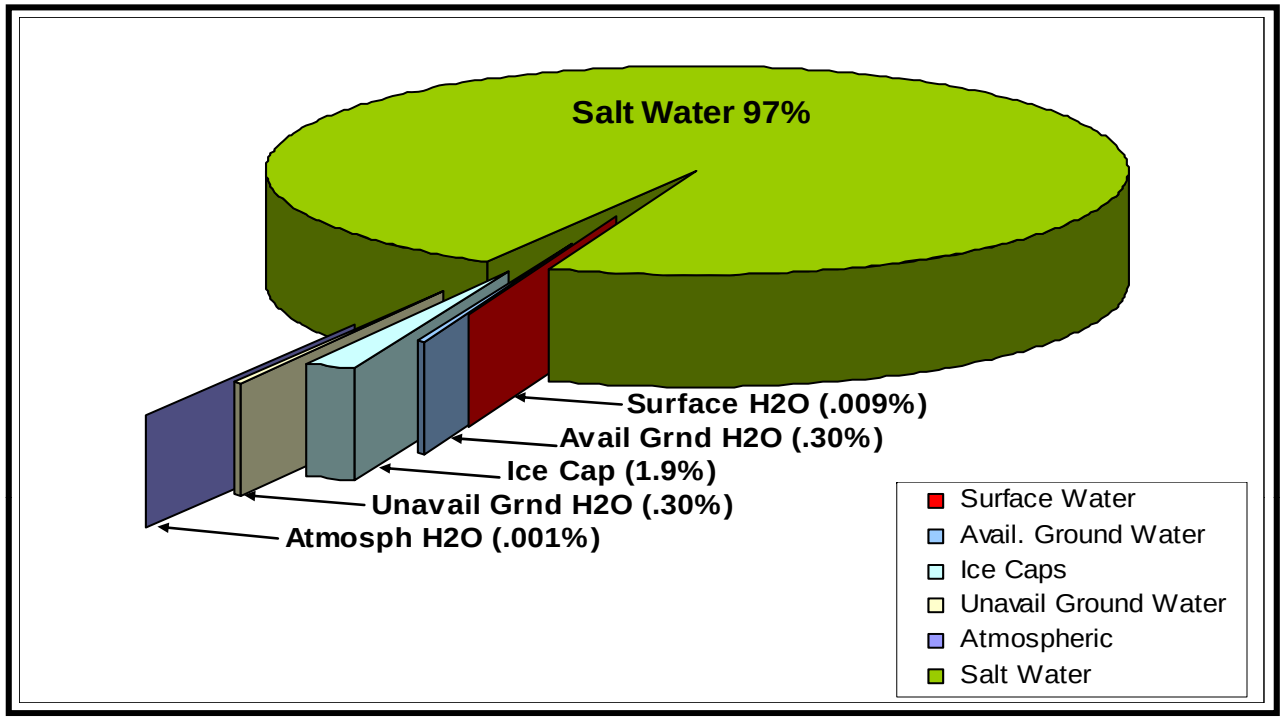


PROBLEM IDENTIFICATION:

2. CO$T of operation & maintenance practices



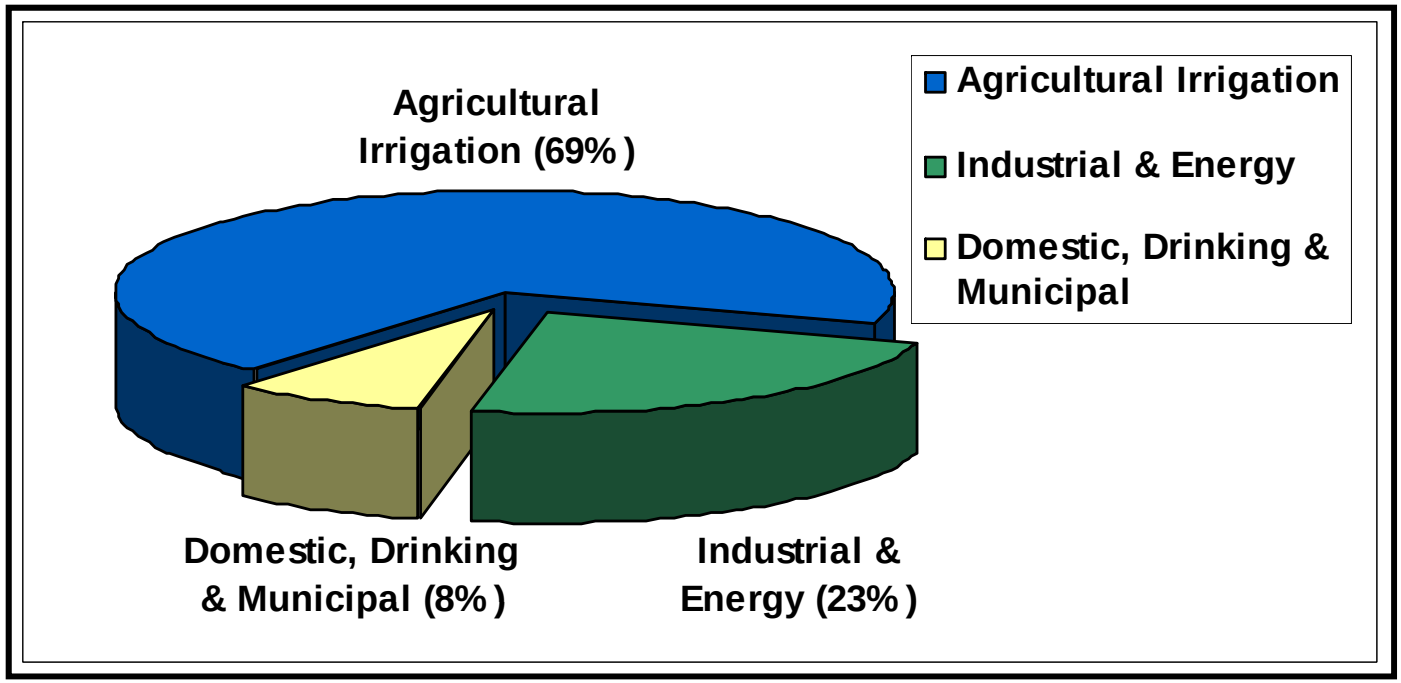
% of Total Global Water



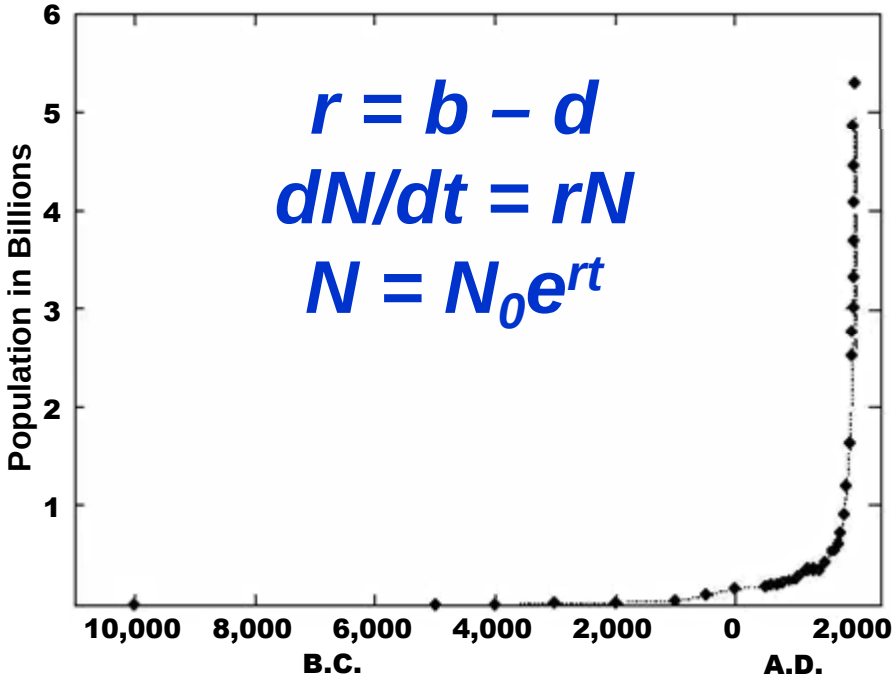
Global Water Sources	Water Volumes (mi^3)	% of Total Fresh Water	% of Total Water
Total Fresh Water	8.40×10^6	100	2.52
Ice Caps	6.37×10^6	76	1.9
Atmospheric	3.1×10^3	.04	.001
Surface Water	3.02×10^4	0.36	0.009
Total Ground Water	2.0×10^6	24	0.60
Avail. Ground Water	1.0×10^6	12	0.30
Unavail. Ground Water	1.0×10^6	12	0.30
Salt Water	3.25×10^8	3869	97.6
Total Water	3.33×10^8	3964	100

Global Water Use

- Agricultural Irrigation (69%)
- Industrial & Energy (23%)
- Domestic, Drinking & Municipal (8%)
- Transportation
- Recreational
- Habitat



World Population Growth



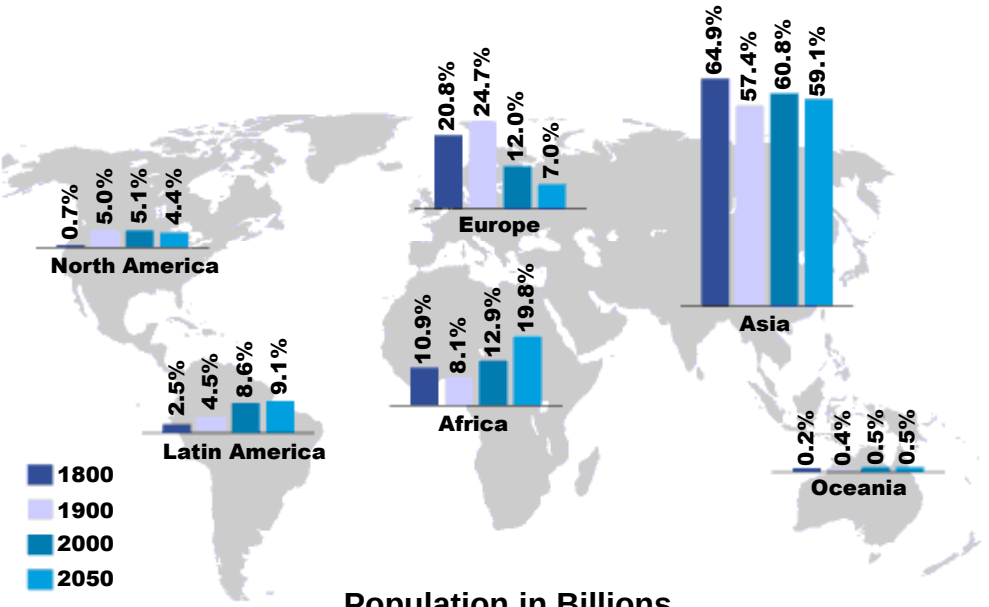
$$r = b - d$$

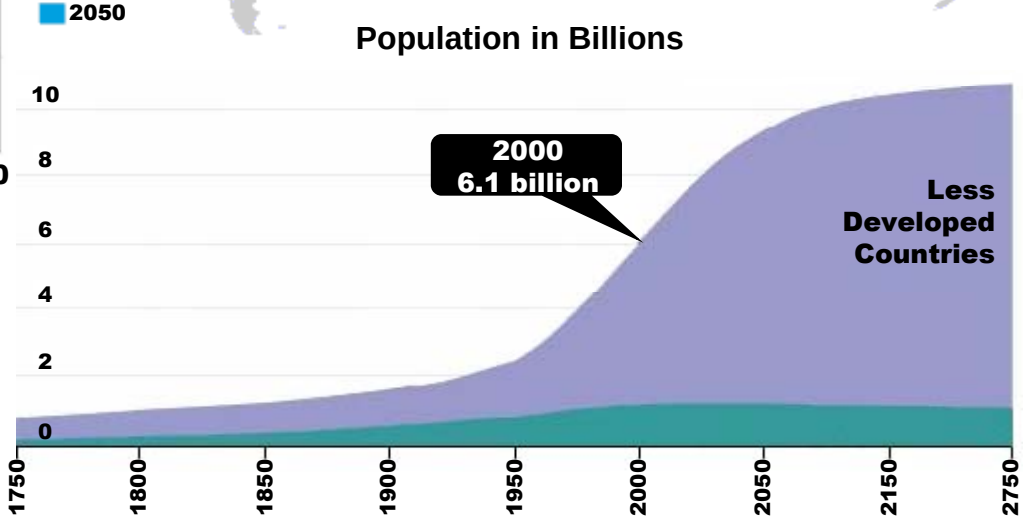
$$dN/dt = rN$$

$$N = N_0 e^{rt}$$

Source: McEvedy and Jones and United Nations

World Population Distribution by Region, 1800–2050





Source: United Nations Population Division, Briefing Packet, 1998 Revision of World Population Prospects

World Population Calculator

Estimates the current world population based on US census data and the world growth rate
(updates every second)

ONE YEAR AGO

(4/20/09)

World Population was:

6,732,135,507

TODAY

(7/27/10)

Current World Population is:

6,827,795,582

World Population increases by nearly

100 Million

in a little over ONE Year

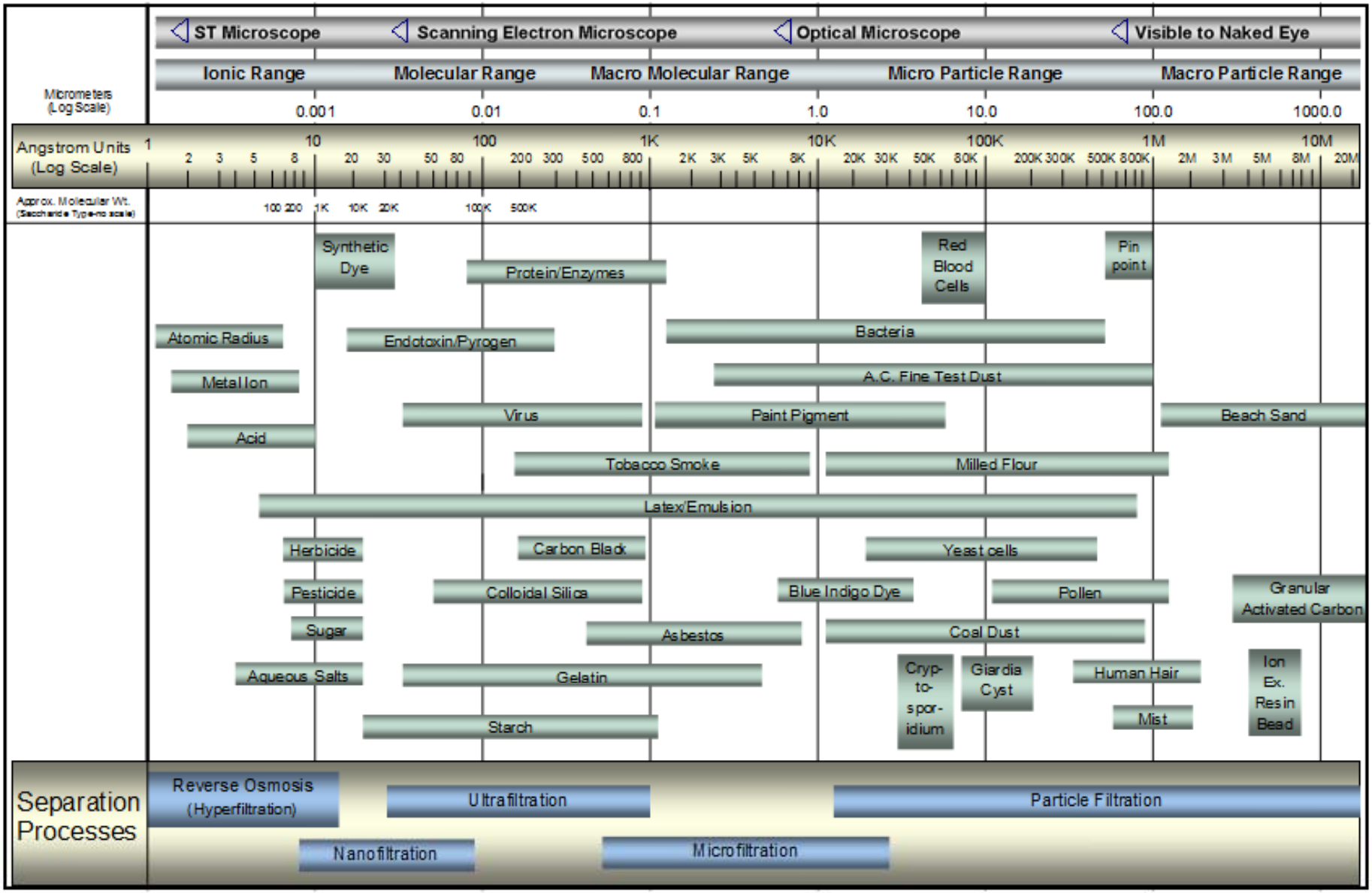
http://www.onlineconversion.com/world_population.htm

EXCE$$IVE COT

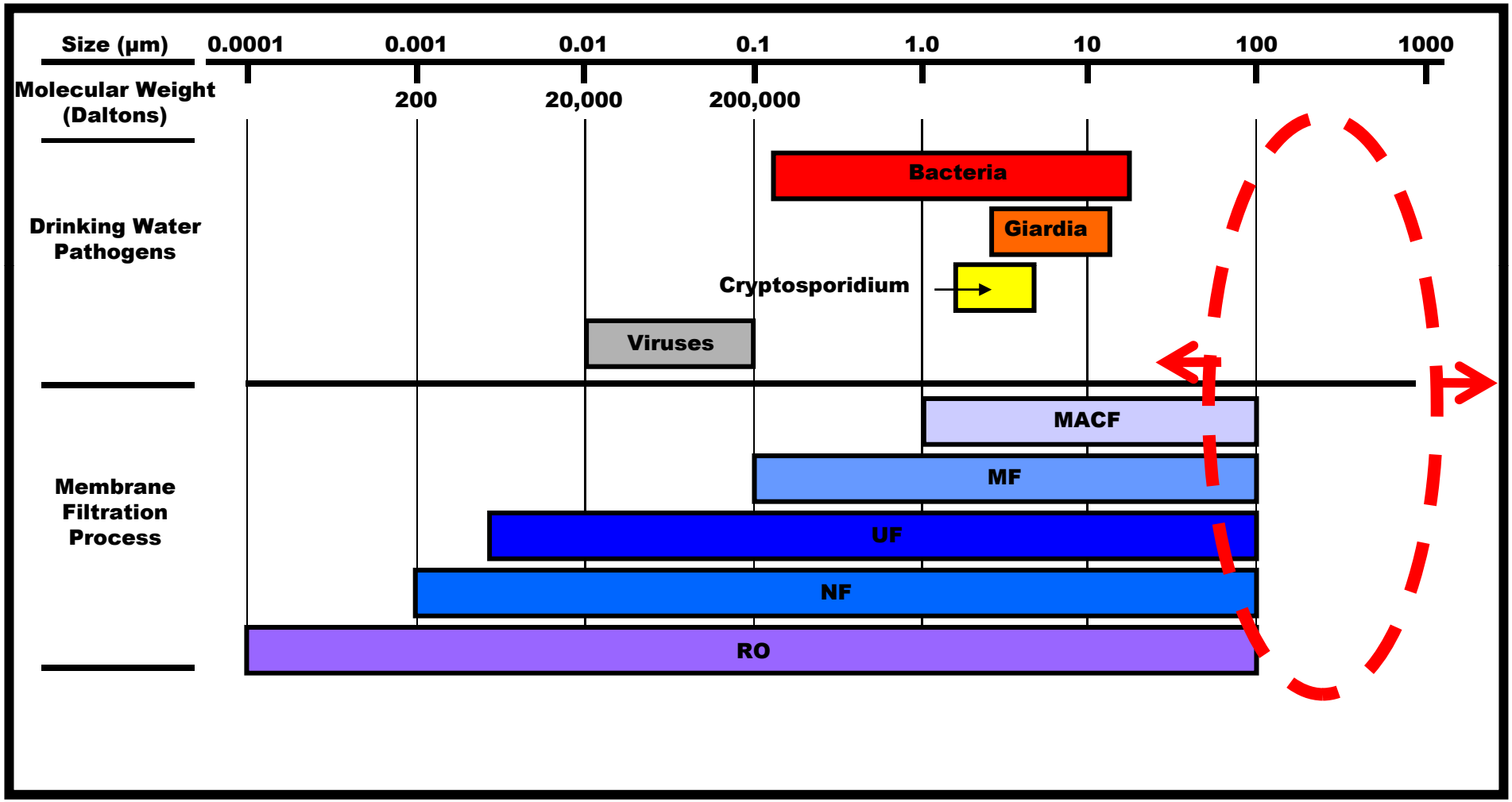
in

Conventional Industrial Process Treatment

Filtration and Separation Spectrum

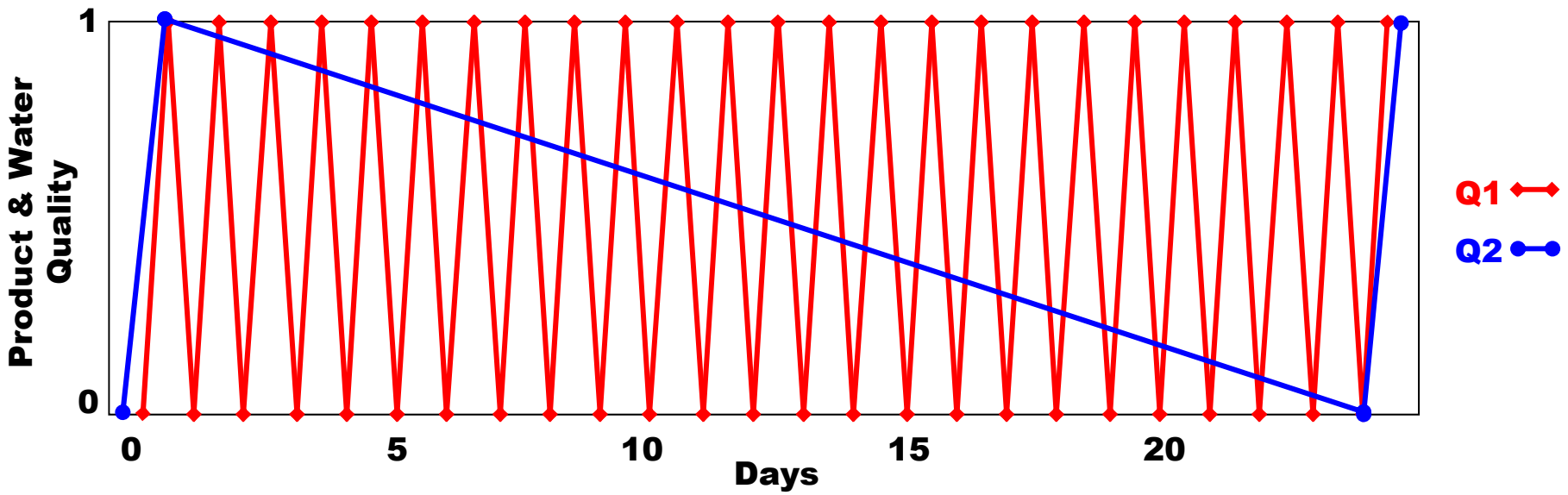


Filtration Regime

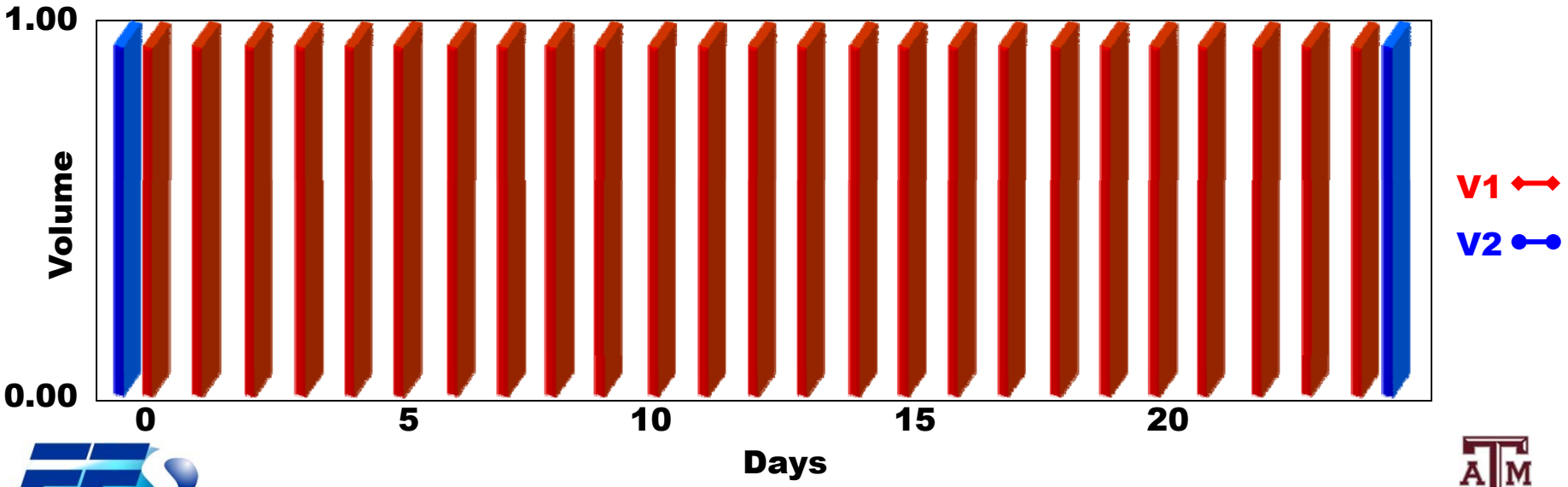


Impact Summary

Normalized Quality vs Days



Cumulative Water Volume & Chemical Used



Sustainability Initiatives

1. HydraKleen Automatic Liquid-Solid Separator

2. Food-Grade Screen Separator

3. Arctic Recirc Skid (ARS)

Sustainability Initiative

HYDRAKLEEN®

www.hydrakleen.com

Automatic Liquid-Solid Separator

HYDRAKLEEN®

Automatic Liquid-Solid Separator

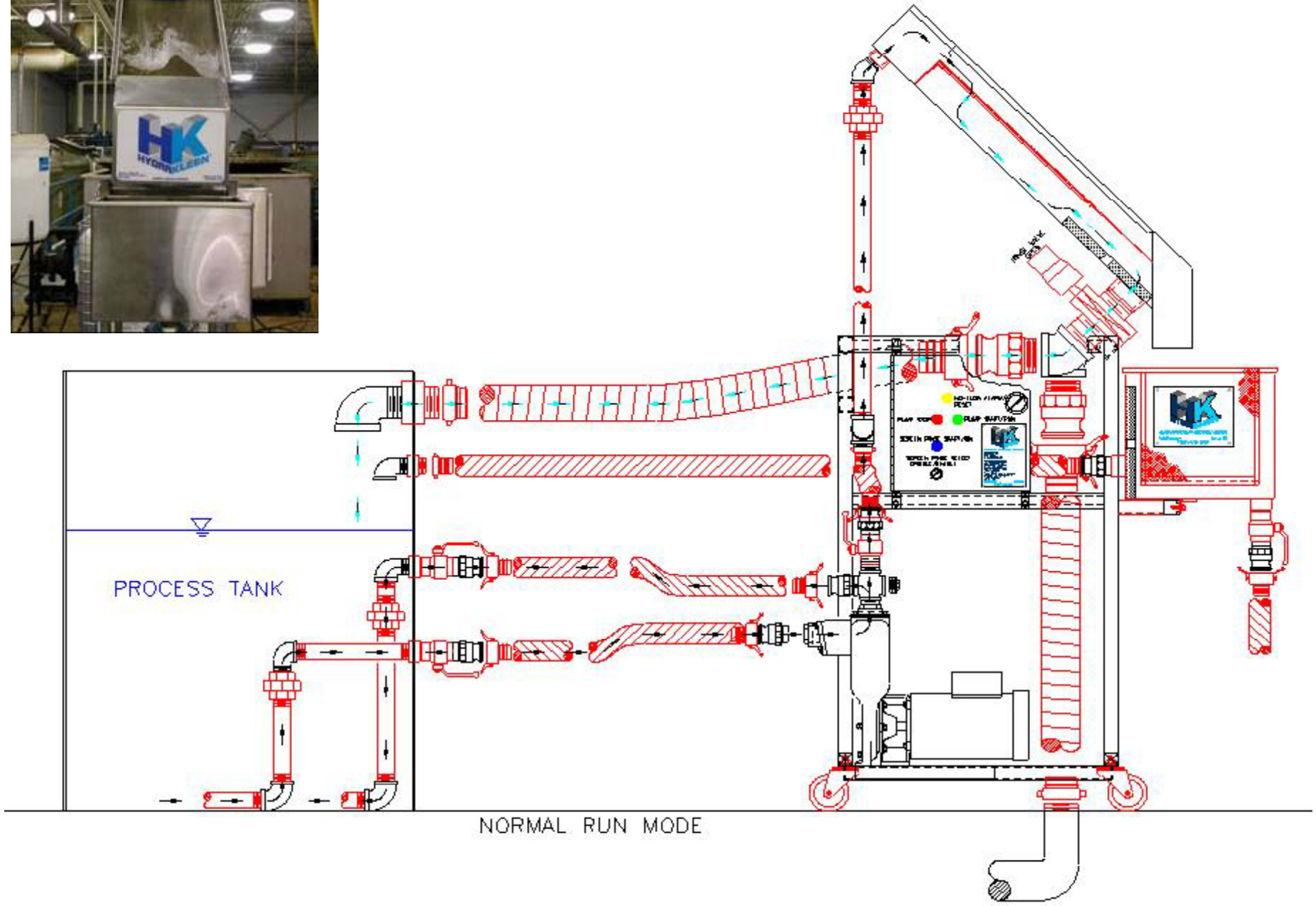
- Saves Water, Chemicals & Energy
- Advances Reuse & Reclamation
- Increases Product Throughput
- Improves Product Quality
- Promotes Sustainable Growth
- Reduces Operation & Maintenance Costs
- Reduces Waste Treatment
- Eliminates Consumable Media

HYDRAKLEEN

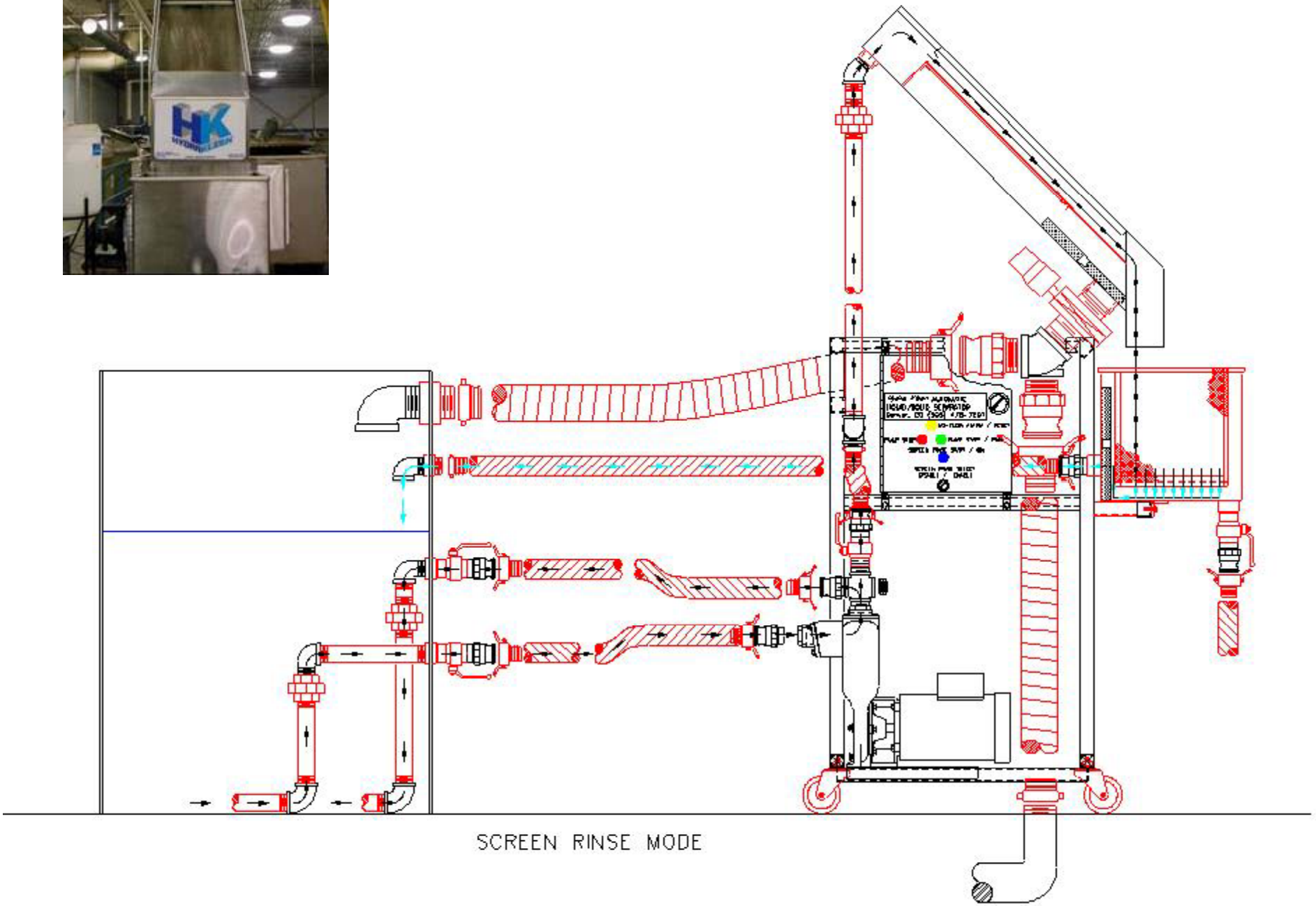
Four Modes of Operation

- Normal Run Mode
- Screen Rinse Mode
- Blowdown/Drain Mode
- Maintenance Mode

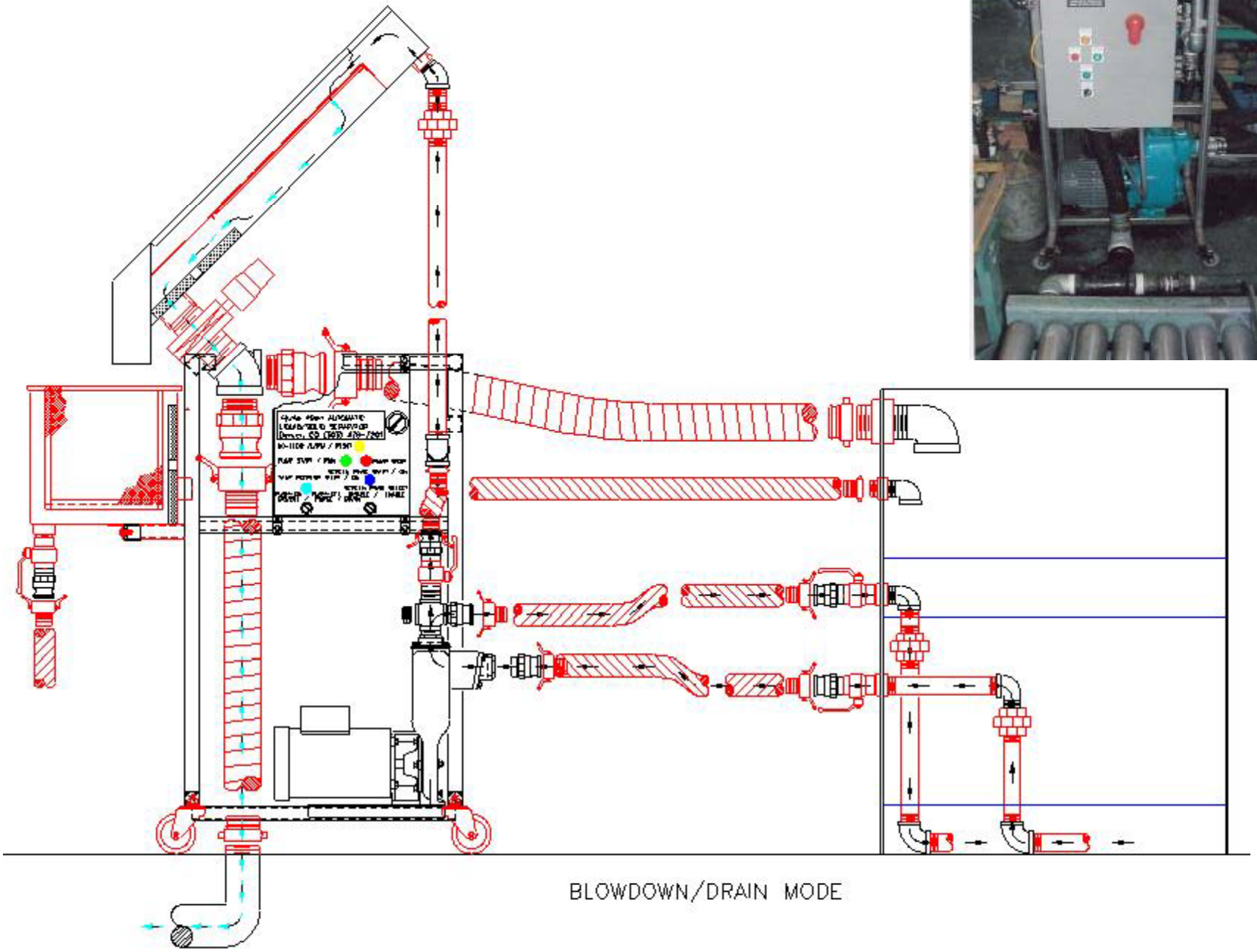
Normal Run Mode



Screen Rinse Mode

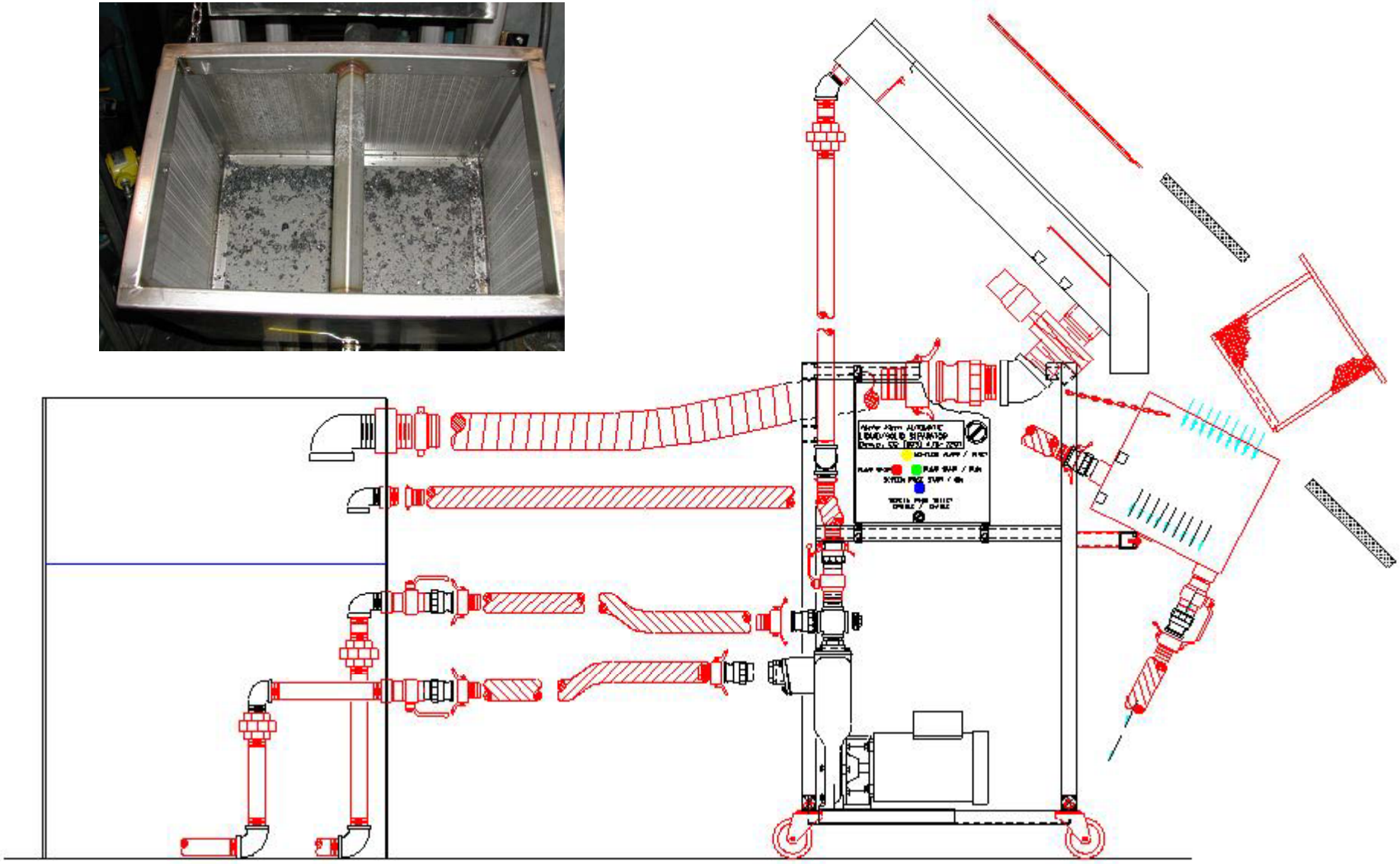


Blowdown/Drain Mode



BLOWDOWN/DRAIN MODE

Maintenance Mode



MAINTENANCE MODE

Normal Run Mode

Screen Rinse Mode

Normal Run Mode

Screen Rinse Mode

Turning 2-day Dump Interval into 4 WEEKS

Total Immersion Agitation/Rinse Tanks

Comes Fully Assembled

Complete-packaged Unit

- Separation Pan w/ Hillside Screen
- Screen Rinse & Drain Valves
- Basket Screen
- Sedimentation Box
- Pump
- Controller
- Mobile & Adjustable Height Stand
- Magnets *(option)*
- Oil/Water Separator *(option)*
- Bactericidal *(option)*

Interconnections

Installation requirements:

- 4 Hydraulic connections
- Electrical power supply
- Air supply

HK easily adapts & orients to any configuration

Industrial Process Tanks

- Immersion/Agitation Tanks
- Spray Washer Conveyors
- Parts Washers
- Rinse Tanks
- Holding Tanks
- Reservoir Tanks
- Equalization Tanks
- Settling & Flotation Tanks

Hydraulic & Financial Performance

Hydraulic Performance

- Connects to any process tank
- Handles extremely heavy solid loading rates (in excess of 50%)
- May be used on other industrial liquids besides water
- Easily adapts to existing process configurations & ergonomically orients to Operator
- May be connected hydraulically in-line or in sidestream
- Integral flowswitch prevents pump from running dry
- Automatic self-cleaning mode requires no auxiliary water nor alternative spraying nor direct mechanical cleaning systems
- Zero discharge
- Capable of reclaiming liquids and/or solids
- Excellent prefilter for finer filtration equipment; eliminates obstructed nozzles in spray systems
- Stainless steel filter elements in varying pore size easily removed and replaced for optimizing hydraulic performance
- Optionally separates immiscible oils and fine ferrous material from liquids
- Self-priming pump good for lift & low suction head applications
- No strict physical property requirements of solids in specific gravity, size, shape or character; no strict pressure or flow requirements

Financial Performance

- High capacity to footprint ratio
- Short payback period—high return on investment
- Dramatically extends the useful life of water and chemical additives
- Greatly reduces operation & maintenance costs
- Greatly reduces wastewater treatment costs
- Low energy consumption with energy-efficient design
- Very low asset depreciation rate
- Environmentally friendly with filter-to-waste option; advances sustainable growth
- Advances reuse & reclamation

"Invest in Lower Costs"

Operation & Maintenance Attributes

Operation Attributes

- Adjustable height stand easily adapts to elevation requirements of application
- No consumable filtration media
- Eliminates obstructed nozzles in spray systems
- Greatly reduces total suspended solid (TSS) concentrations
- Increases product throughput
- High temperature applications
- Improves product quality and maintains consistent product quality
- Filter-to-waste
- Manual blowdown & drain
- Automatic blowdown & drain
- Easily relinquishes control to a master controller

Maintenance Attributes

- Easy installation & start up with no formal training required
- Open design allows easy access to all components; ergonomic design
- Design has no drilled holes and therefore no mating holes
- Easily retrofits or outfits as original equipment
- Design easily adapted and configured with optional equipment
- Easily disassembled and reassembled with no specialty tools required
- No high-frequency wear parts and only minimal moving parts
- Controls adjustable and easily understand

"STOP Maintaining & START Operating"

"Flexibility in Design"

Equipment Options

Separation Capabilities

- Ferrous--Magnets (ceramic or rare earth)
- Immiscible Oils--Oil/Water Separator
- Bactericidal

Hydraulic

- Tank blowdown (manual or automatic)
- Filter-to-waste (manual or automatic)
- Stainless steel or galvanized piping
- Tank suction manifold (w/ or w/out strainers)
- Tank sparging manifold (w/ or w/out nozzles)
- Stainless steel or bronze body isolation valving
- Viton, Buna or EPDM butterfly valve seating

Pneumatic

- Combination air filter/regulator manifold

Controls

- Sedimentation box proximity switch
- Control locally or by master controller
- Hazardous environment -- explosion-proof

Materials

- Cam-Lok fittings in s/stl, ductile iron or aluminum
- Mill grade or polished s/stl (304 or 316)
- Food grade construction

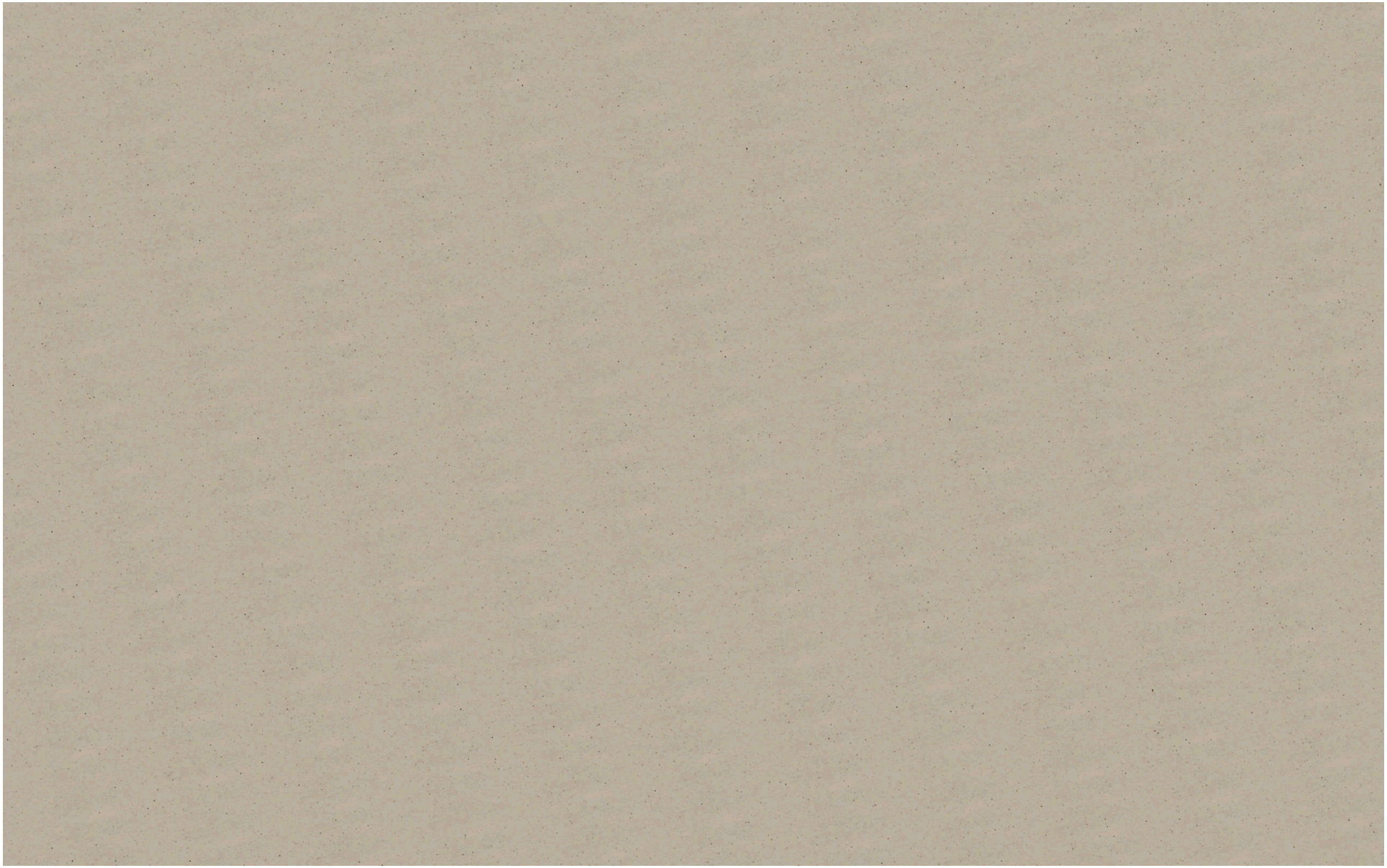
Specifications

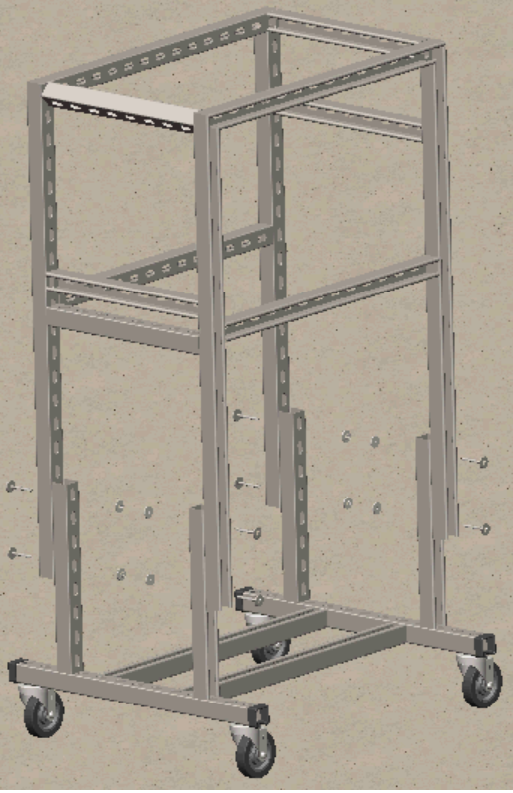
- **Footprint:** 27"x30" for 150-gpm unit
- **Height:** adjustable (7 ft standard)
- **Weight:** 500 lb; 950 lb crated
- **Principle of Operation:** gravity
- **Packaging:** comes fully assembled & uncrated in less than 10 min.
- **Assembly:** self-priming pump, controller, filter elements on mobile skid
- **Installation:** less than one day; no specialty tools required; easily moves on wheel casters
- **Hydraulic Capacity:** 0-2000 gpm standard or larger on special order
- **Two Operational Modes:** *1)* Normal Run Mode; *2)* Screen Rinse Mode
- **Particulate Removal:** nominal < 10-micron; absolute = 50 micron
- **Temperature:** up to 210 degrees F
- **Hydraulic Connections:** 4 hydraulic connections with quick disconnect end fittings
- **Pump:** self-priming trash pump; 1-1/2" suction x 1-1/2" discharge passing 1" spherical solids (larger pump sizes & passage sizes available)
- **Drive:** 2 hp, stainless steel washdown motor (higher hp drives available)
- **Electrical Power Input:** 230 or 460 VAC, 3-phase, 60 hz (alternative voltage, phase and frequency available)
- **Control Voltage Output:** 24 VDC or 120 VAC
- **Flowswitch:** 24 VDC or 120 VAC
- **Controller:** NEMA 4X 340 s/stl enclosure

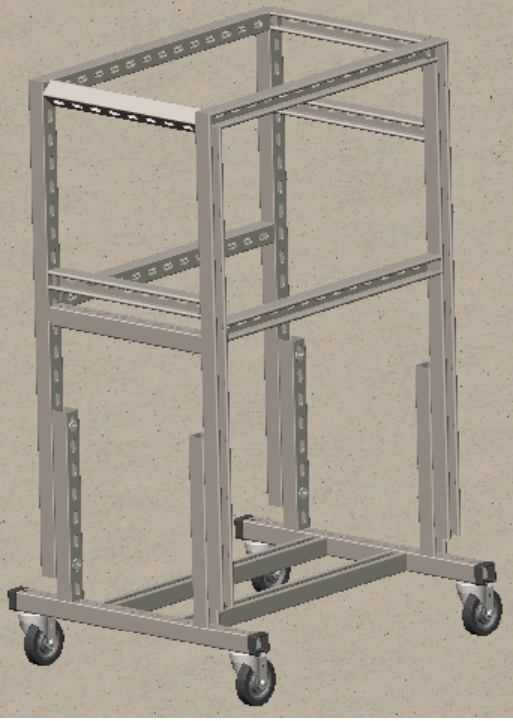
HYDRAKLEEN takes Advantage of Elevation Space

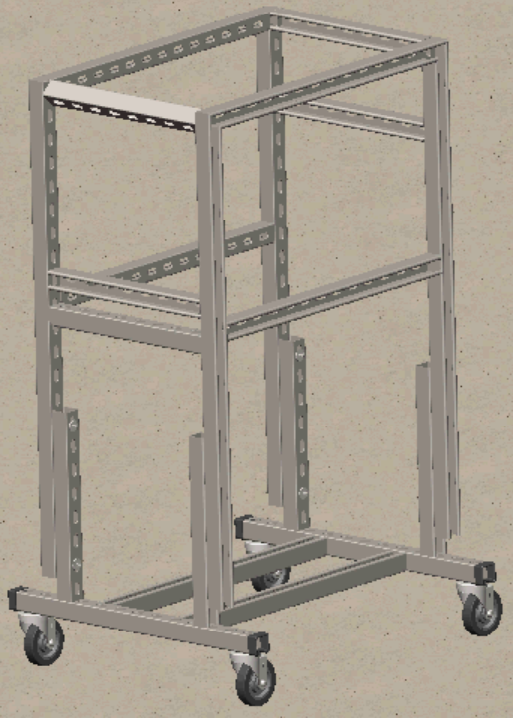
HK Features

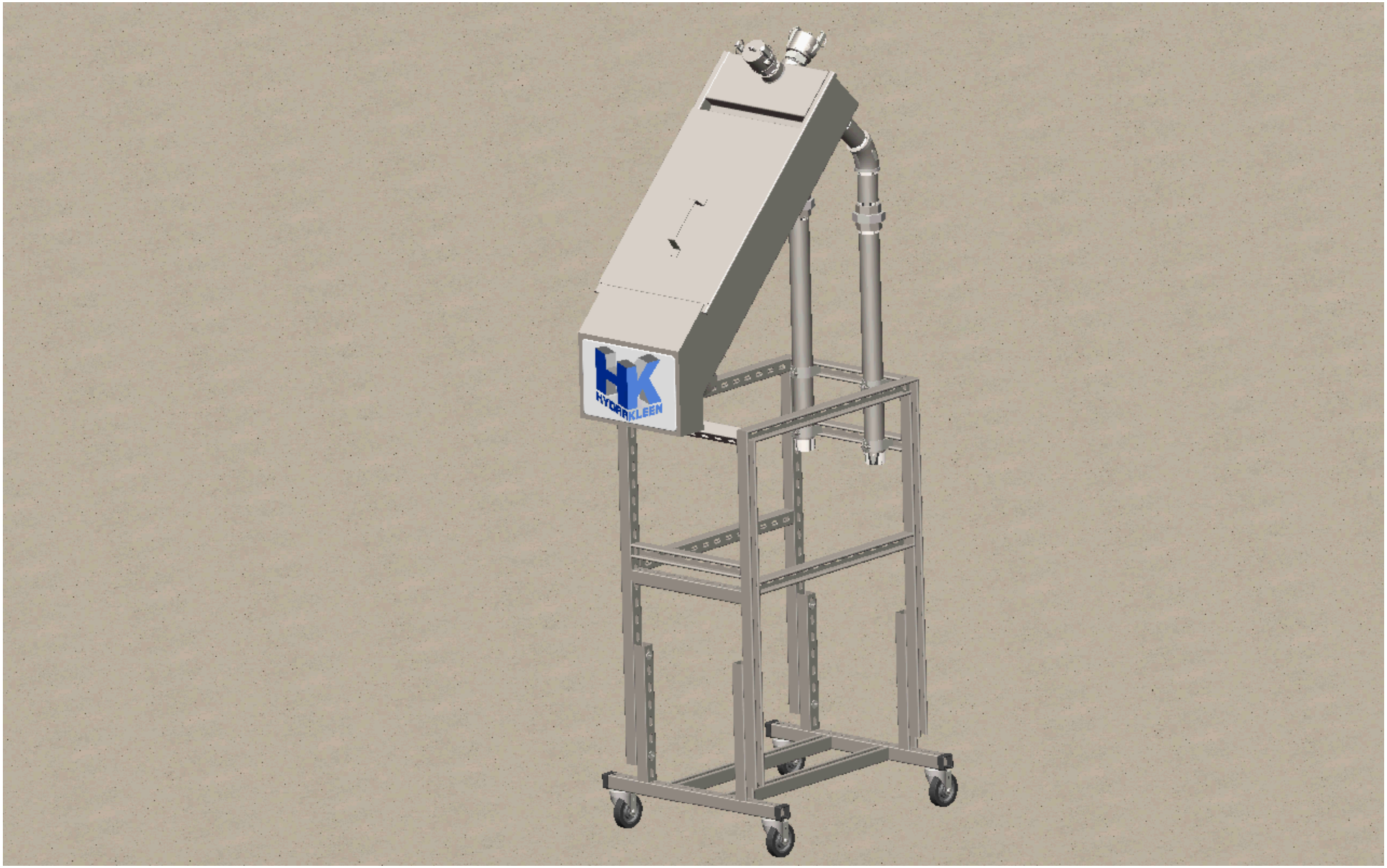
1. Hoppered sedimentation tank
2. Auto purging sed tank
3. Adjustable height
4. Fully automatic
5. Hazardous Environment







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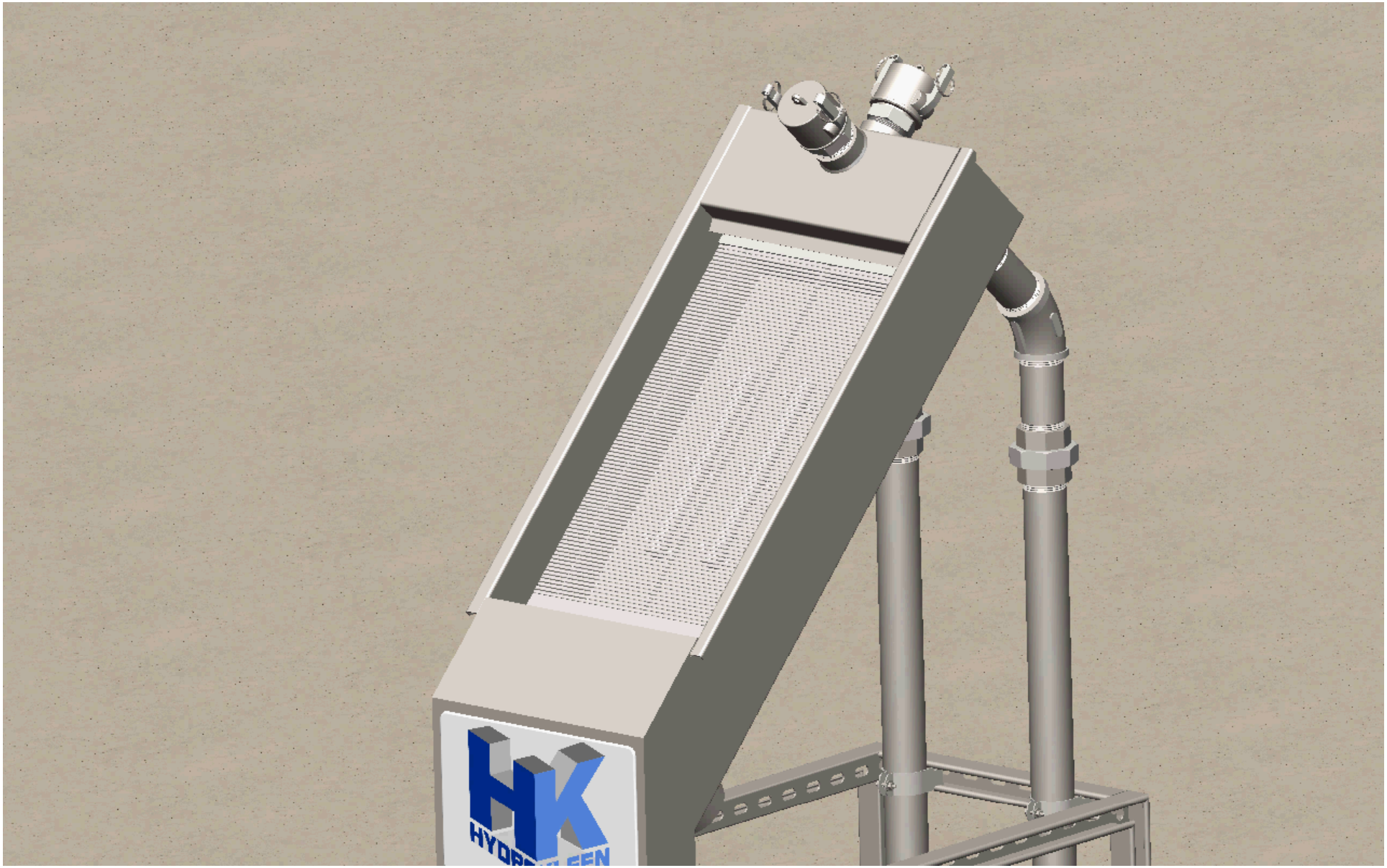
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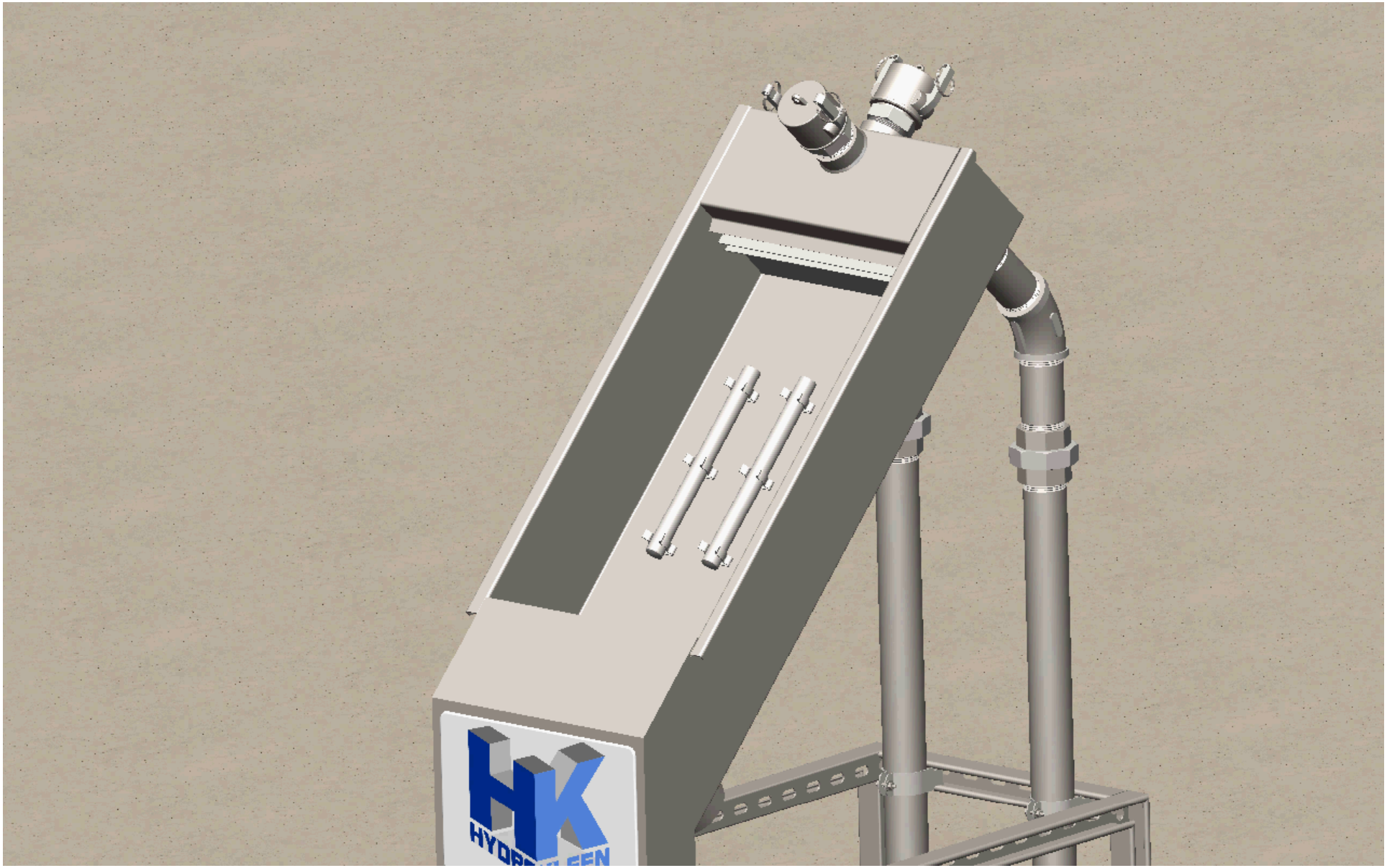
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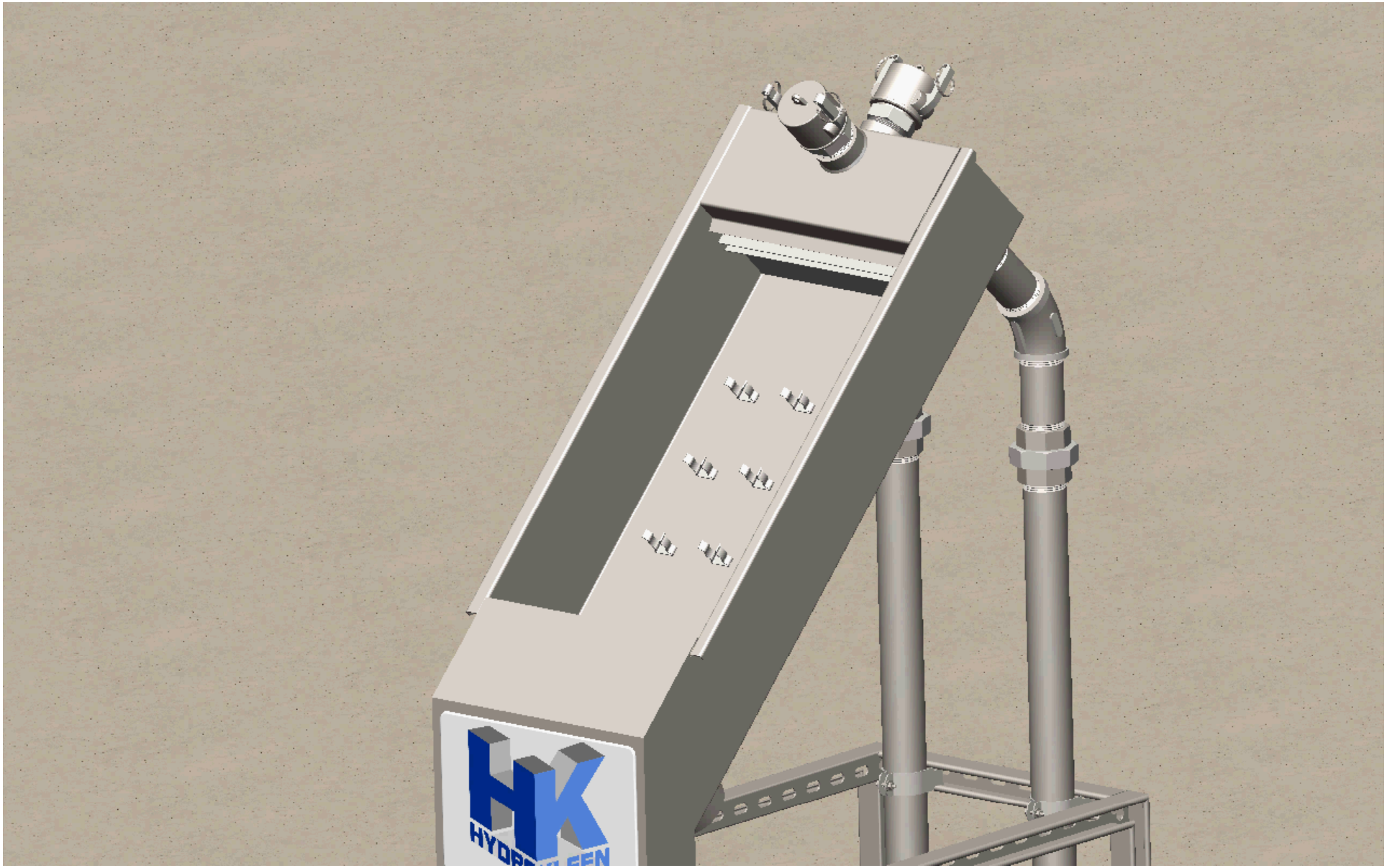
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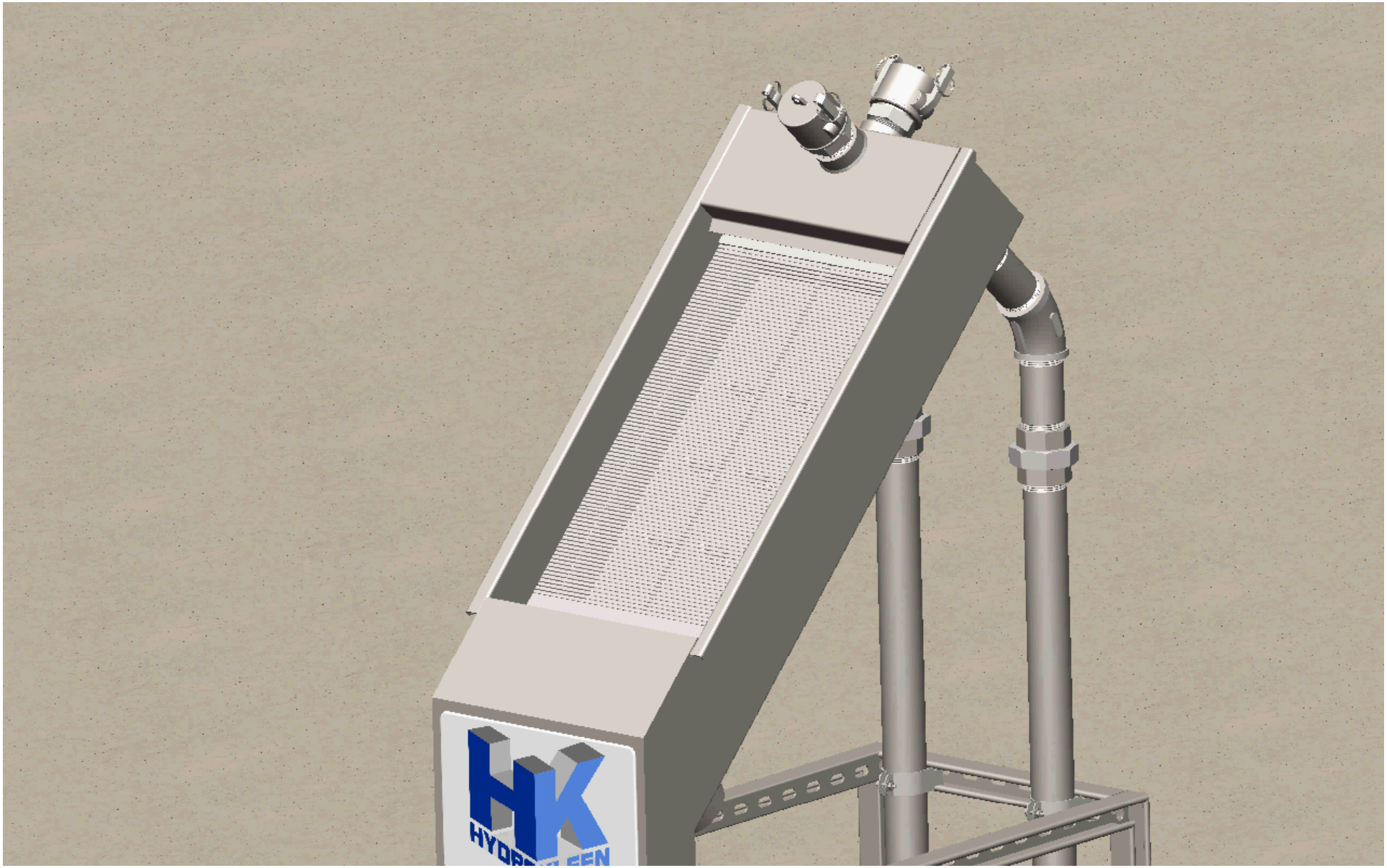
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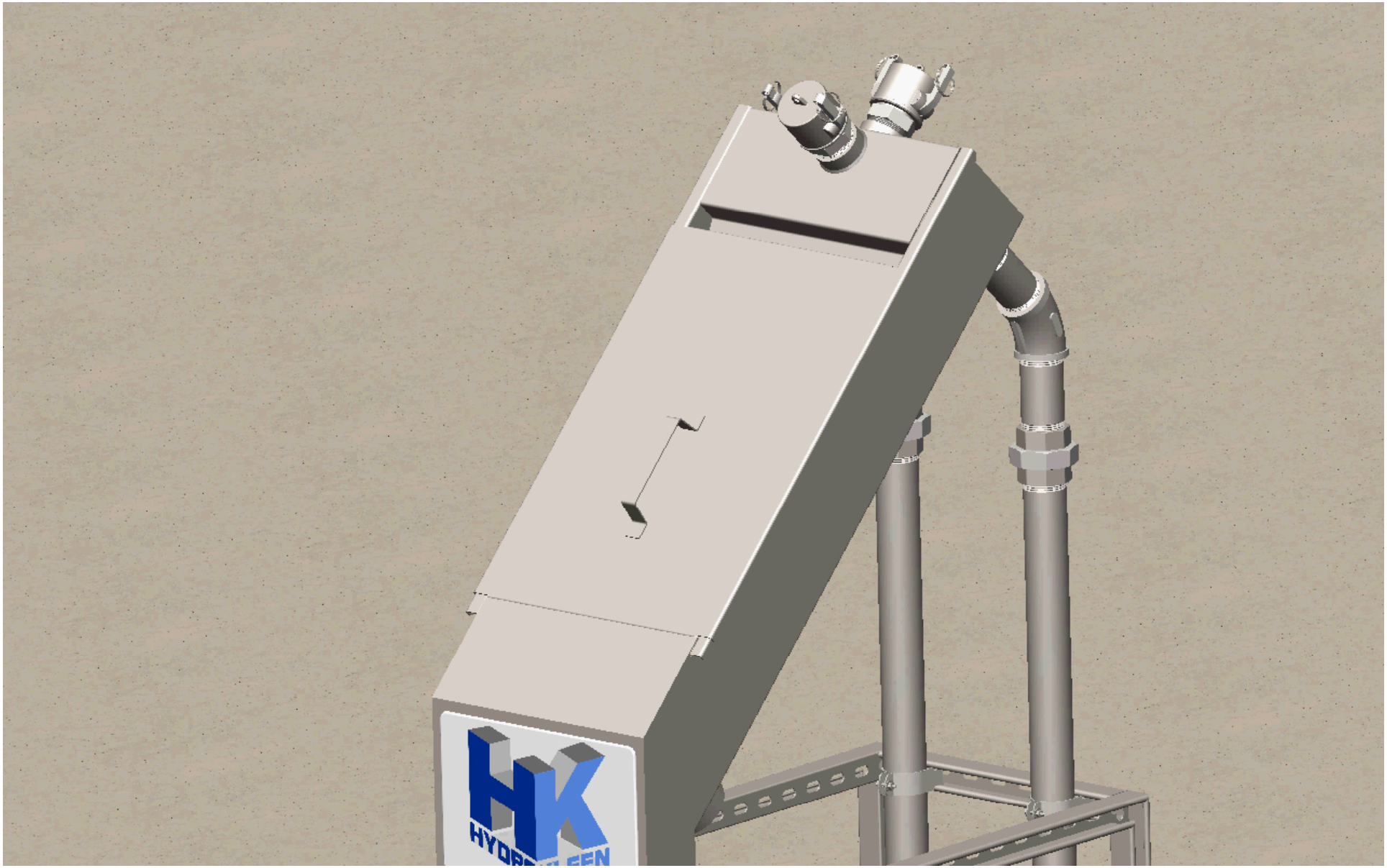
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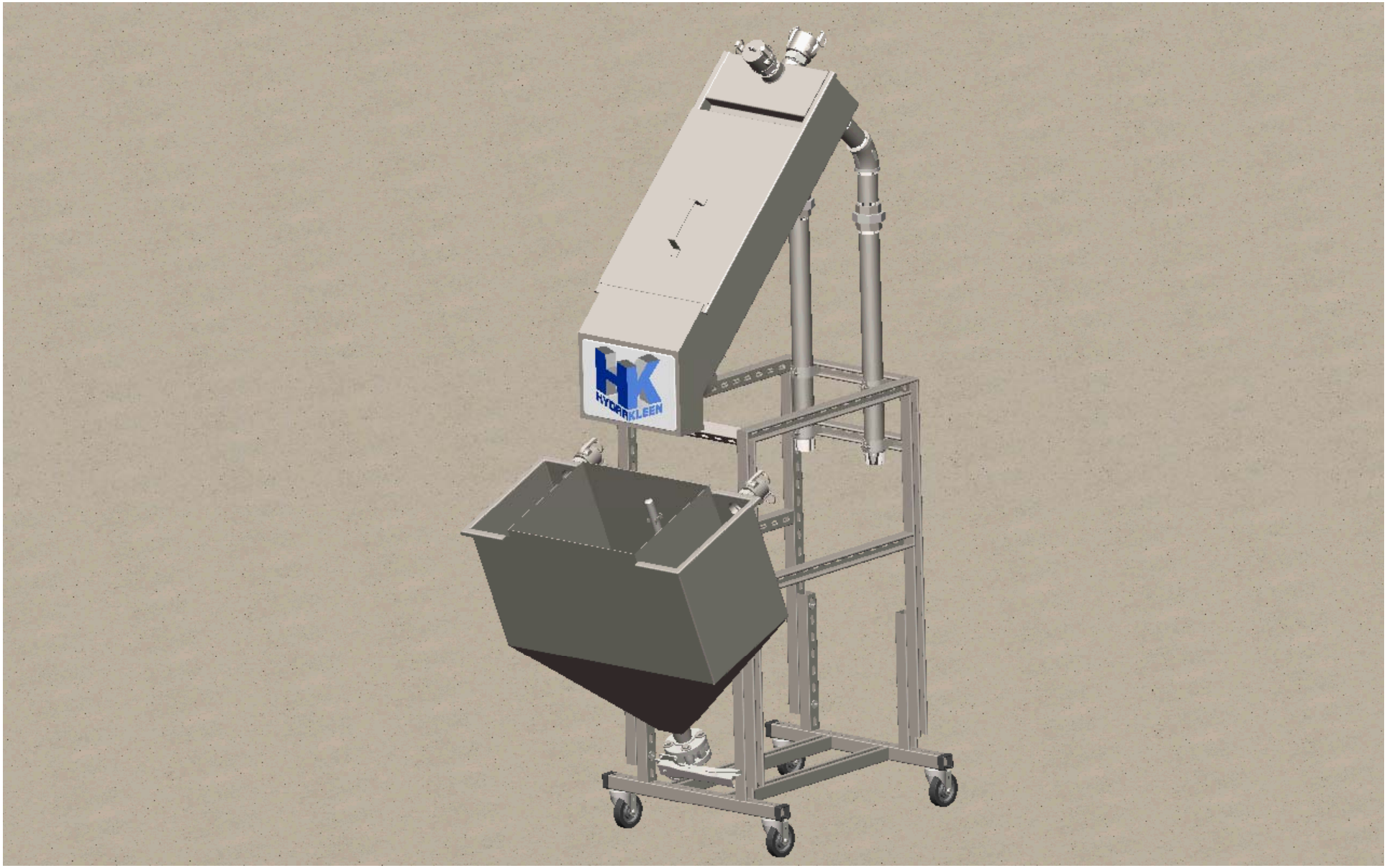
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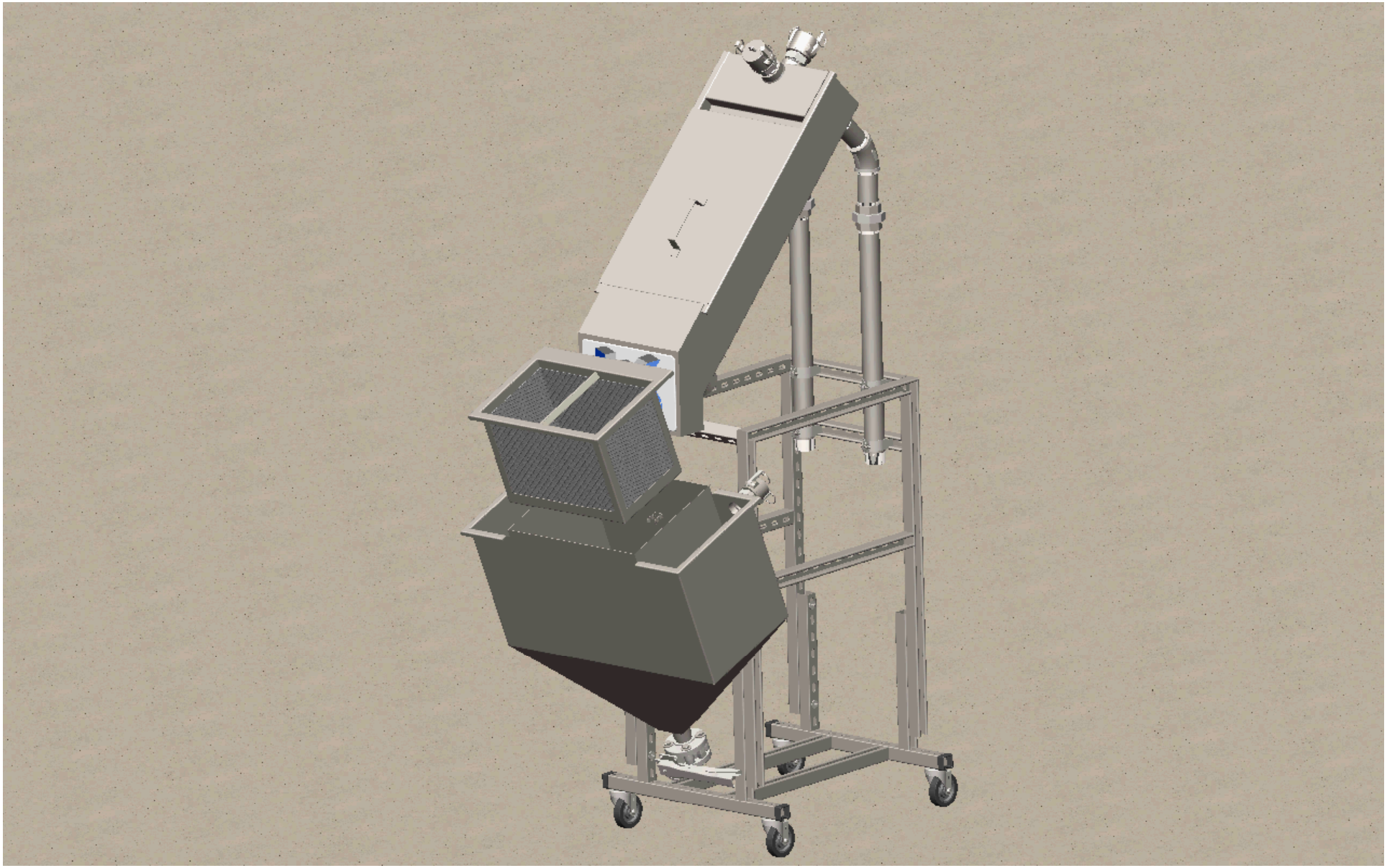

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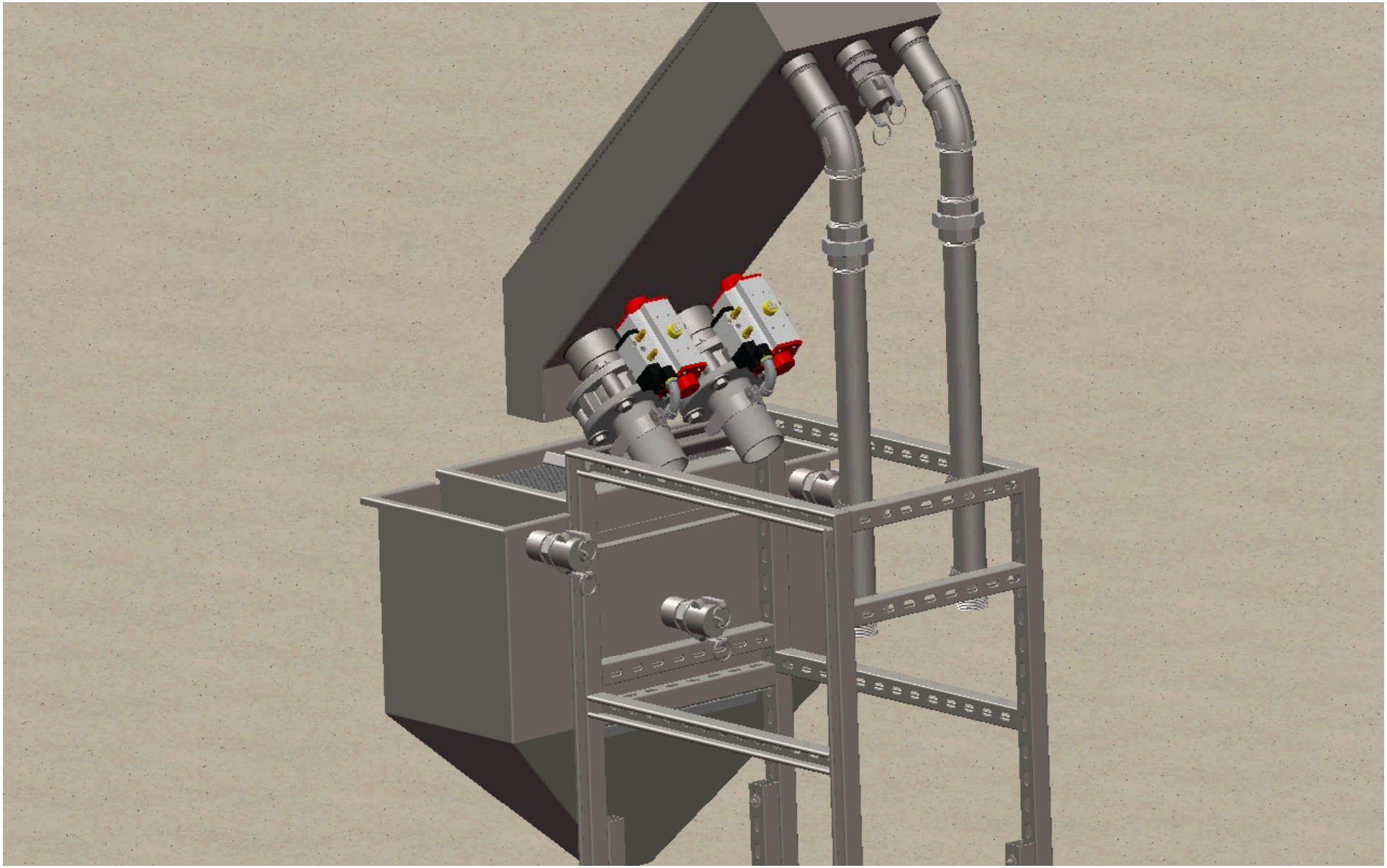

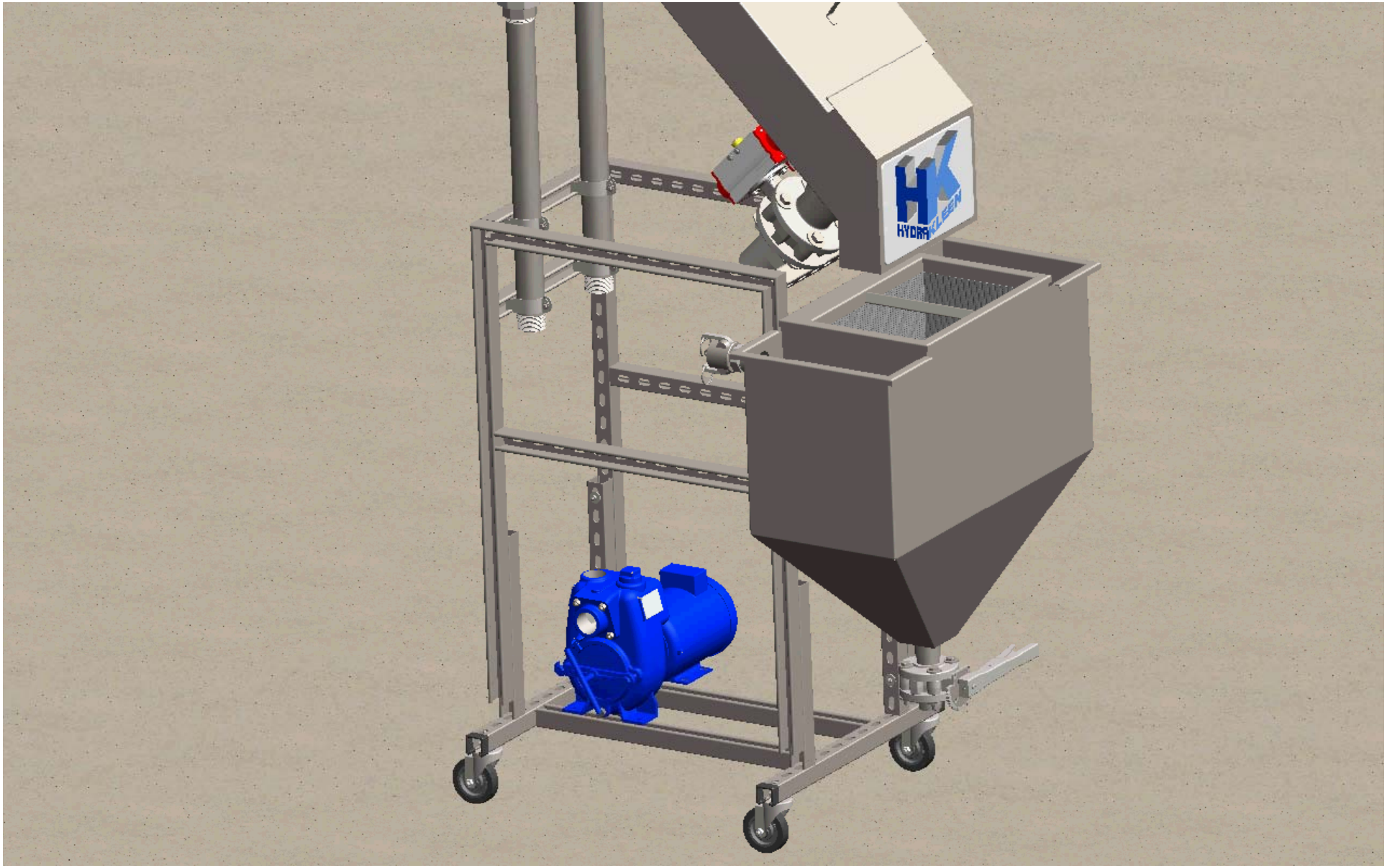
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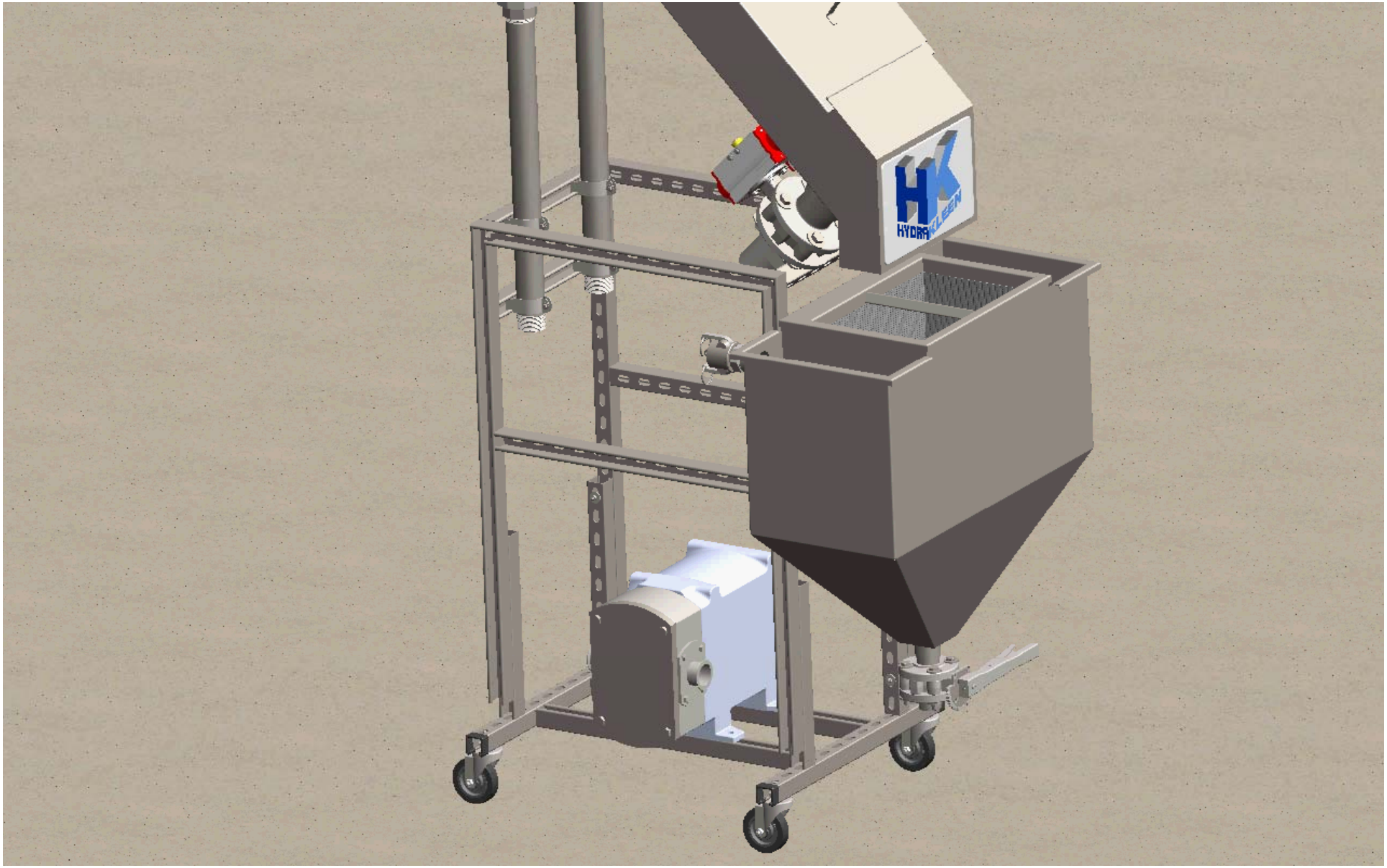
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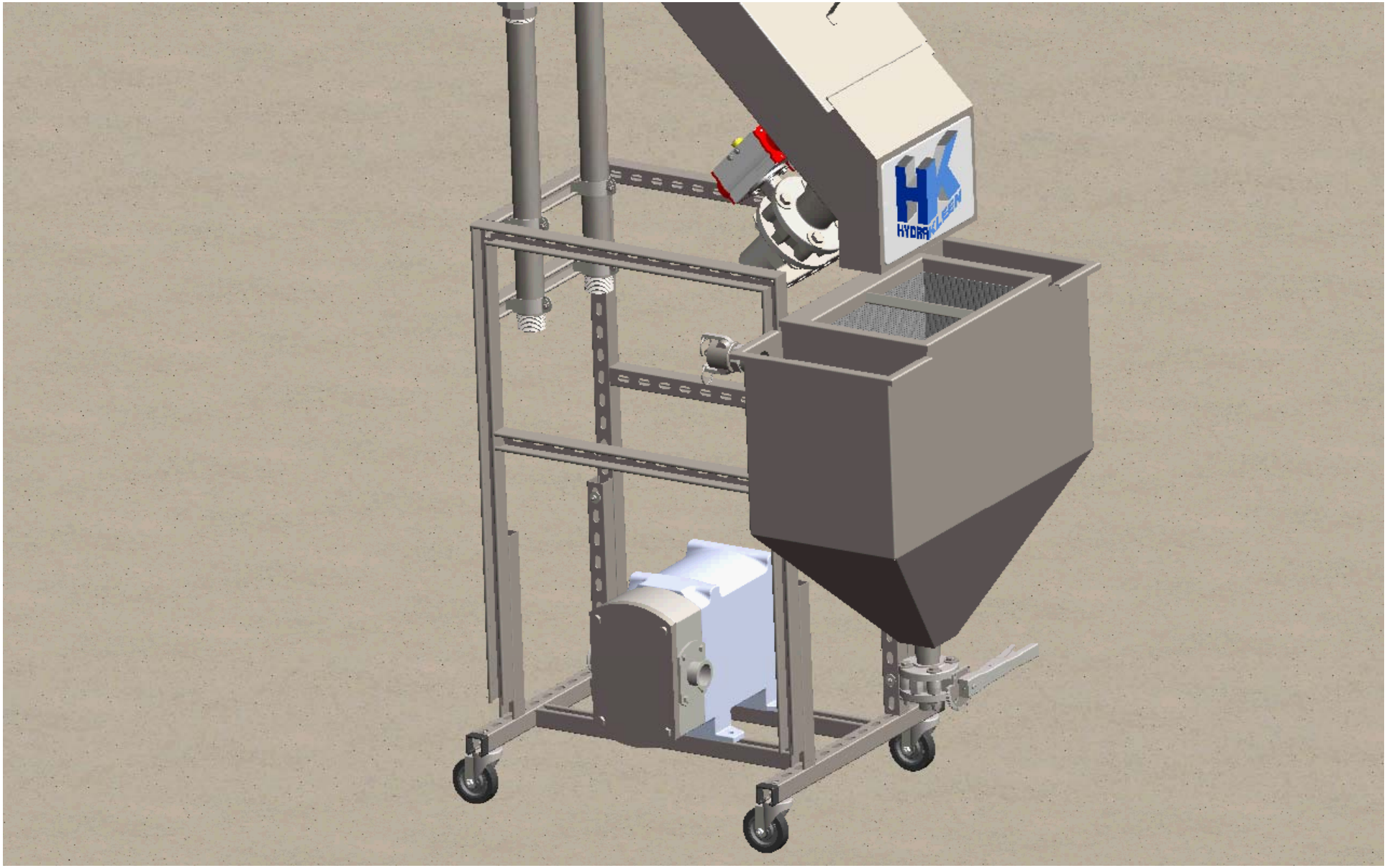
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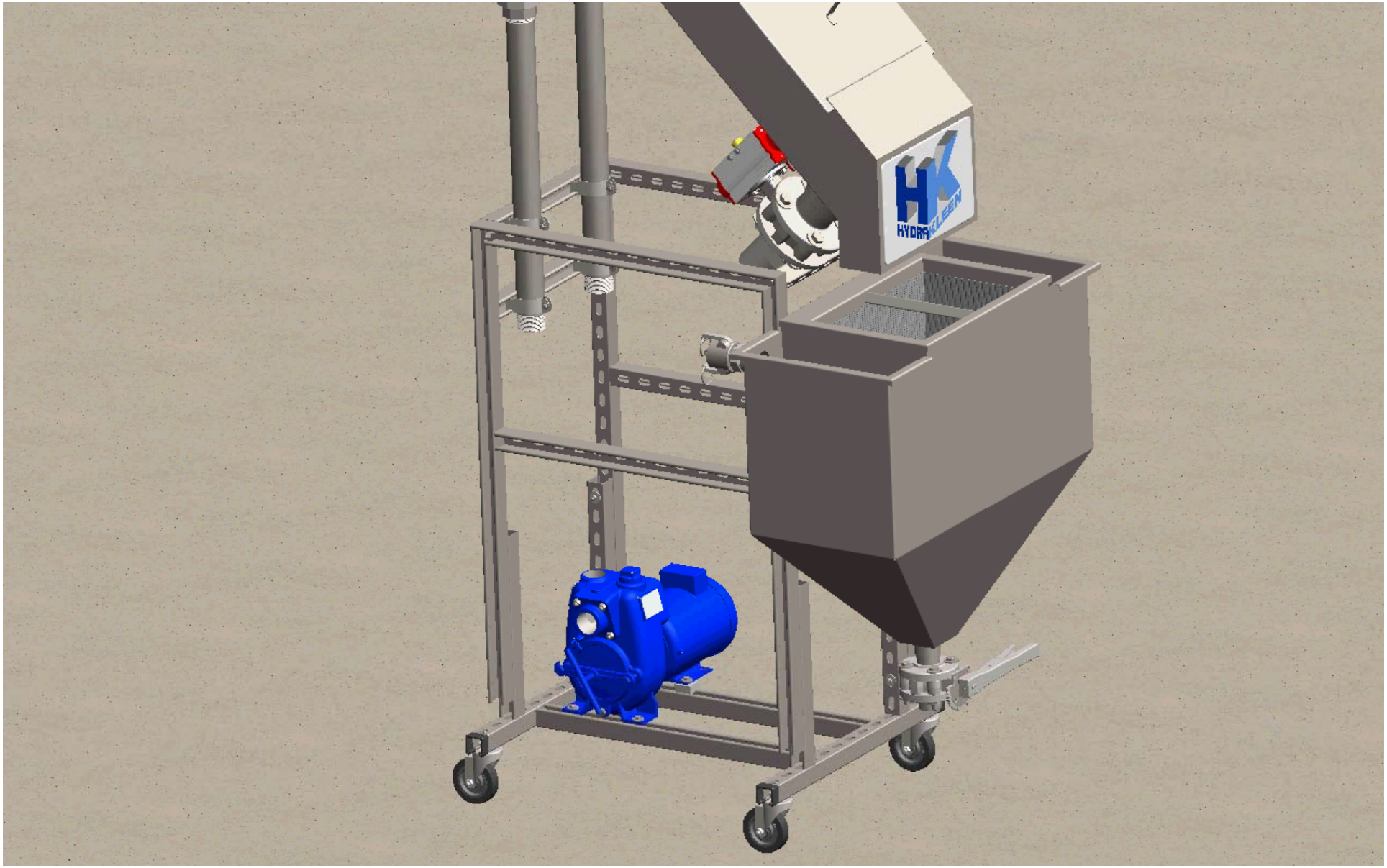
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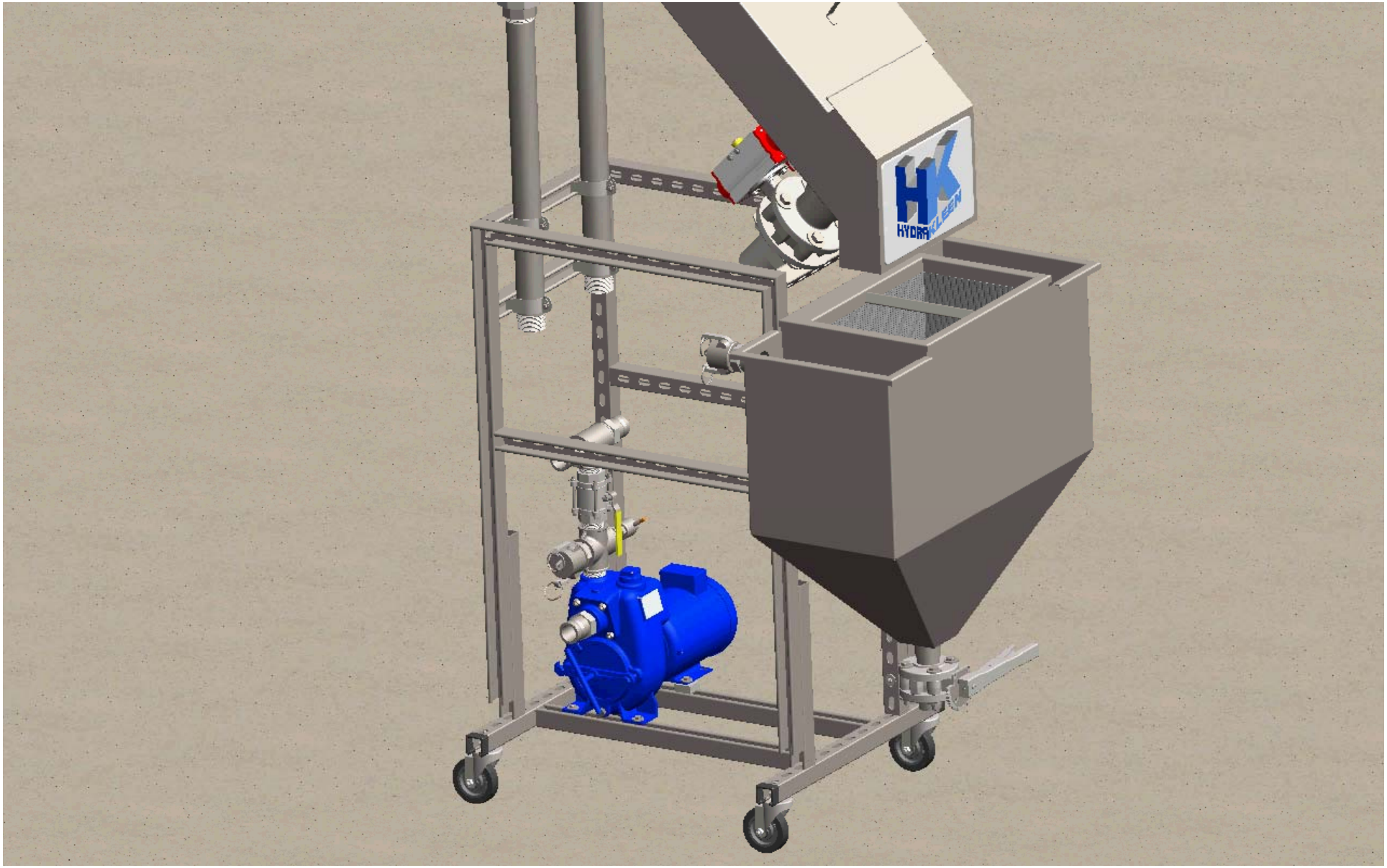
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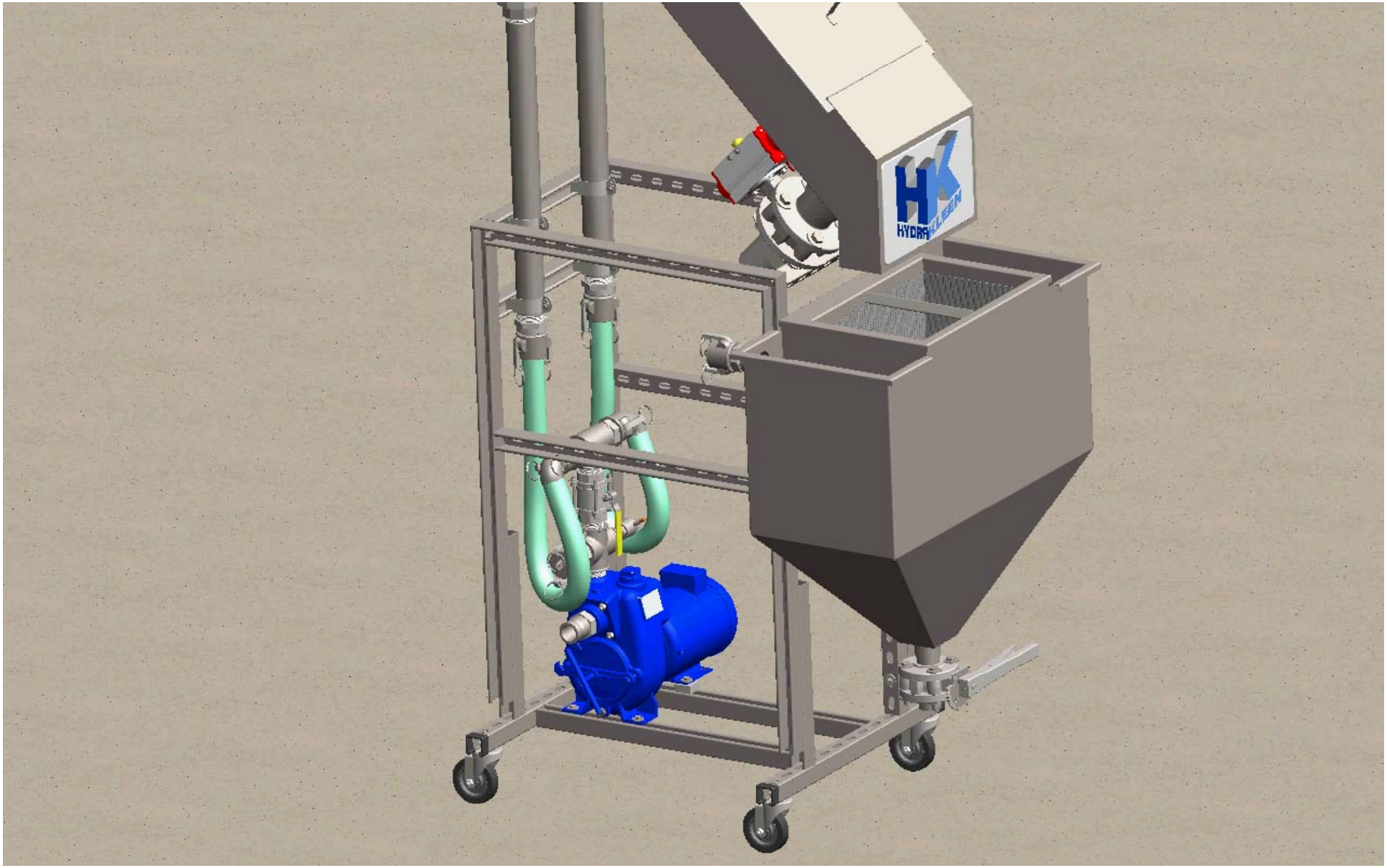
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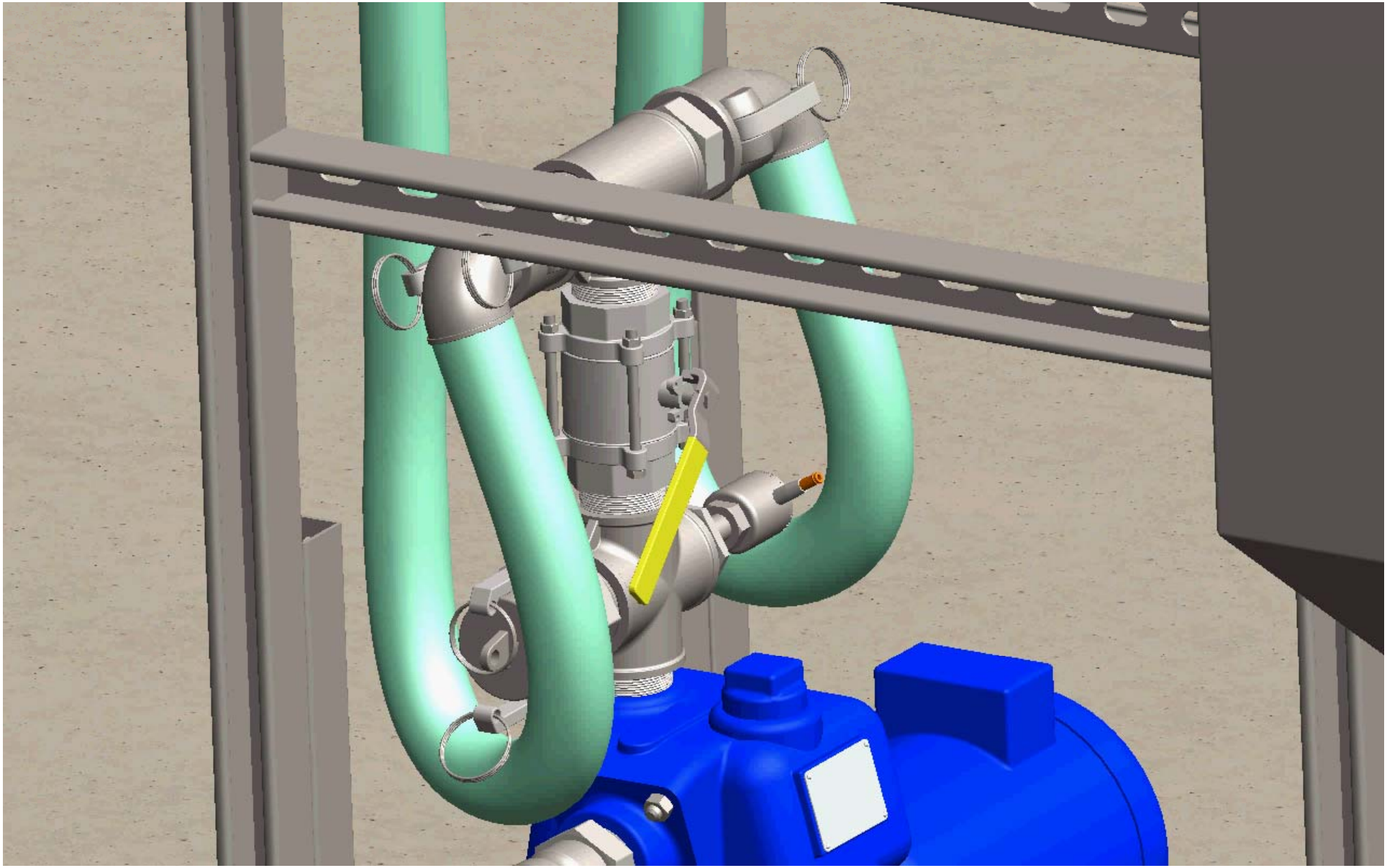

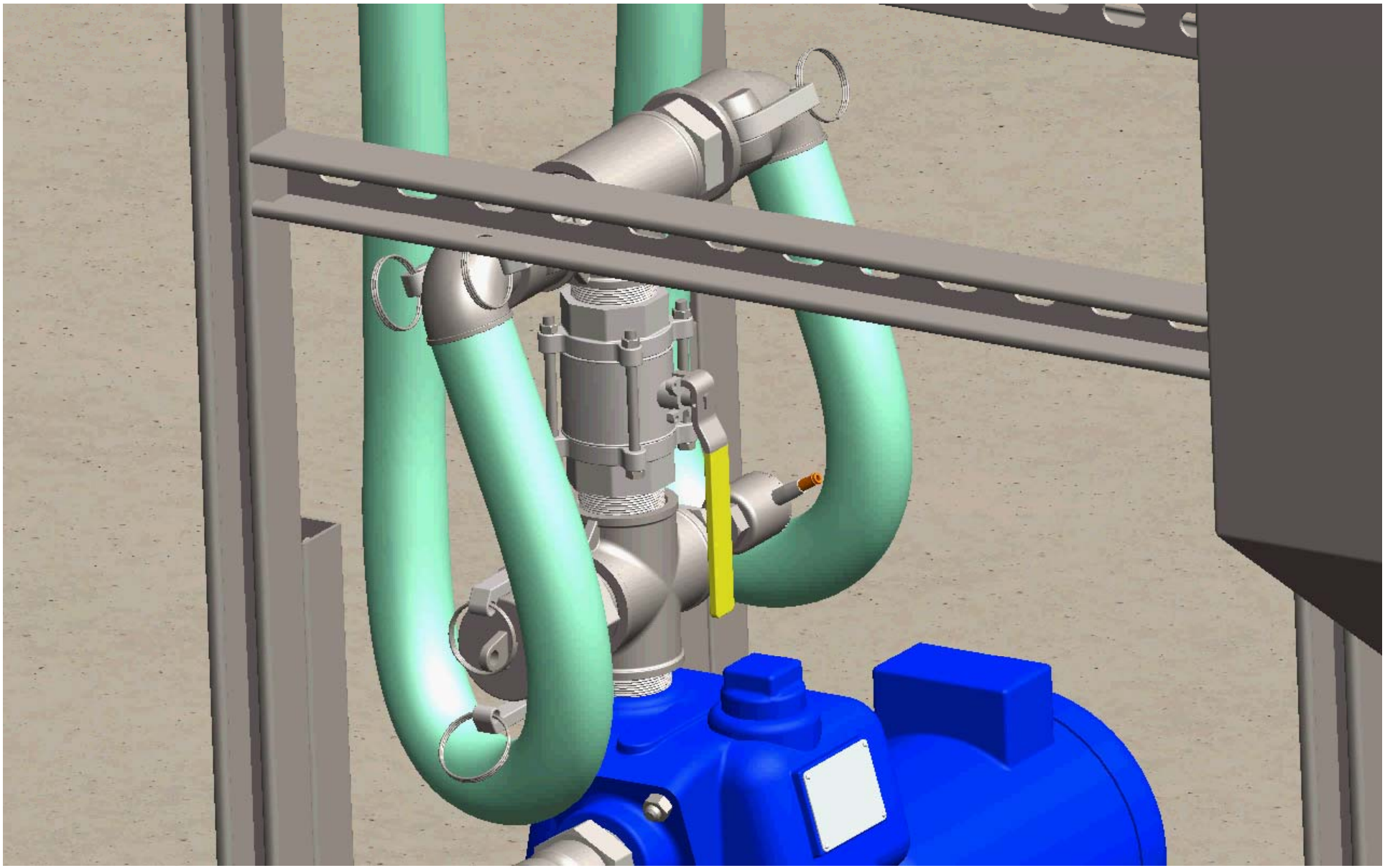

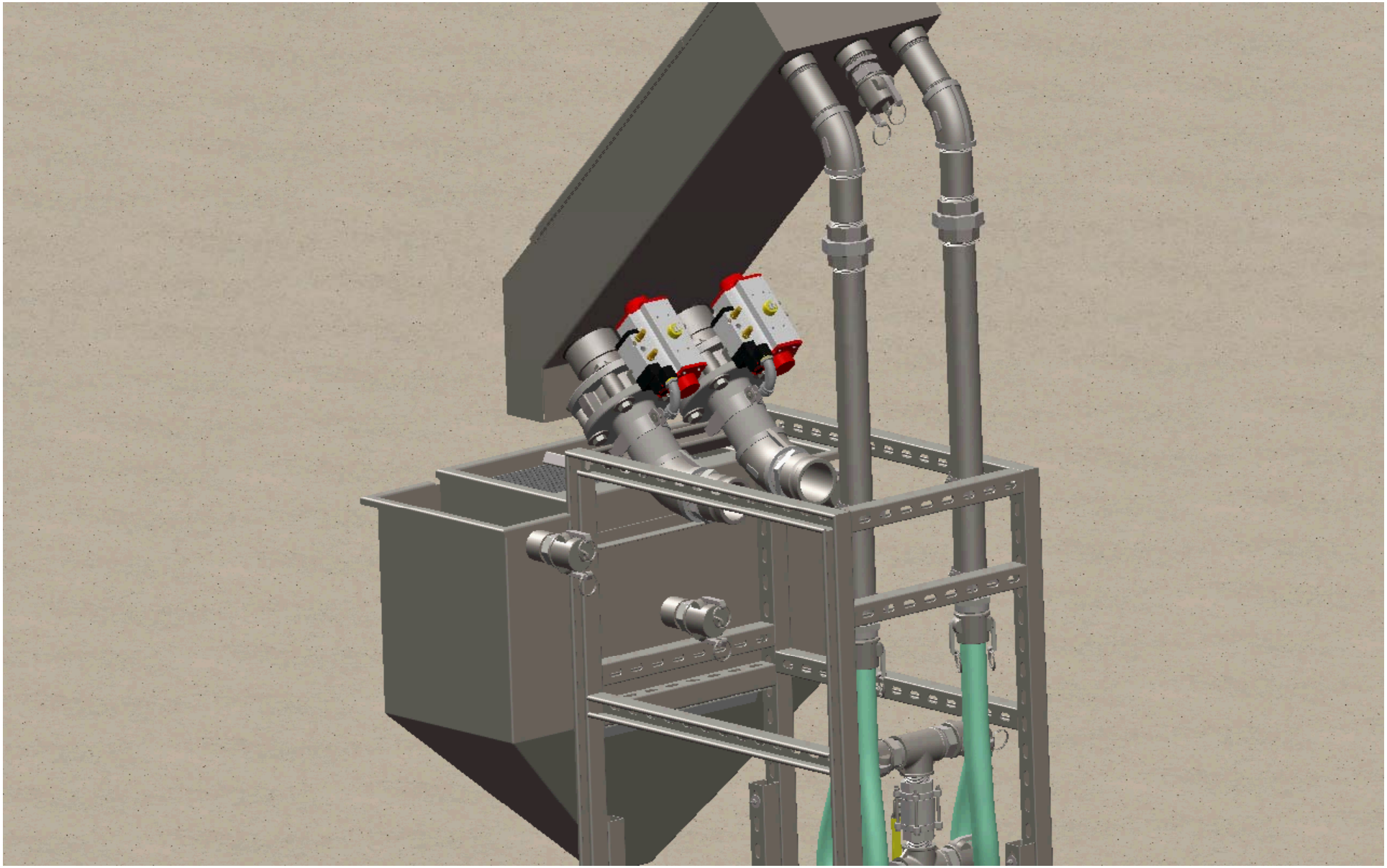

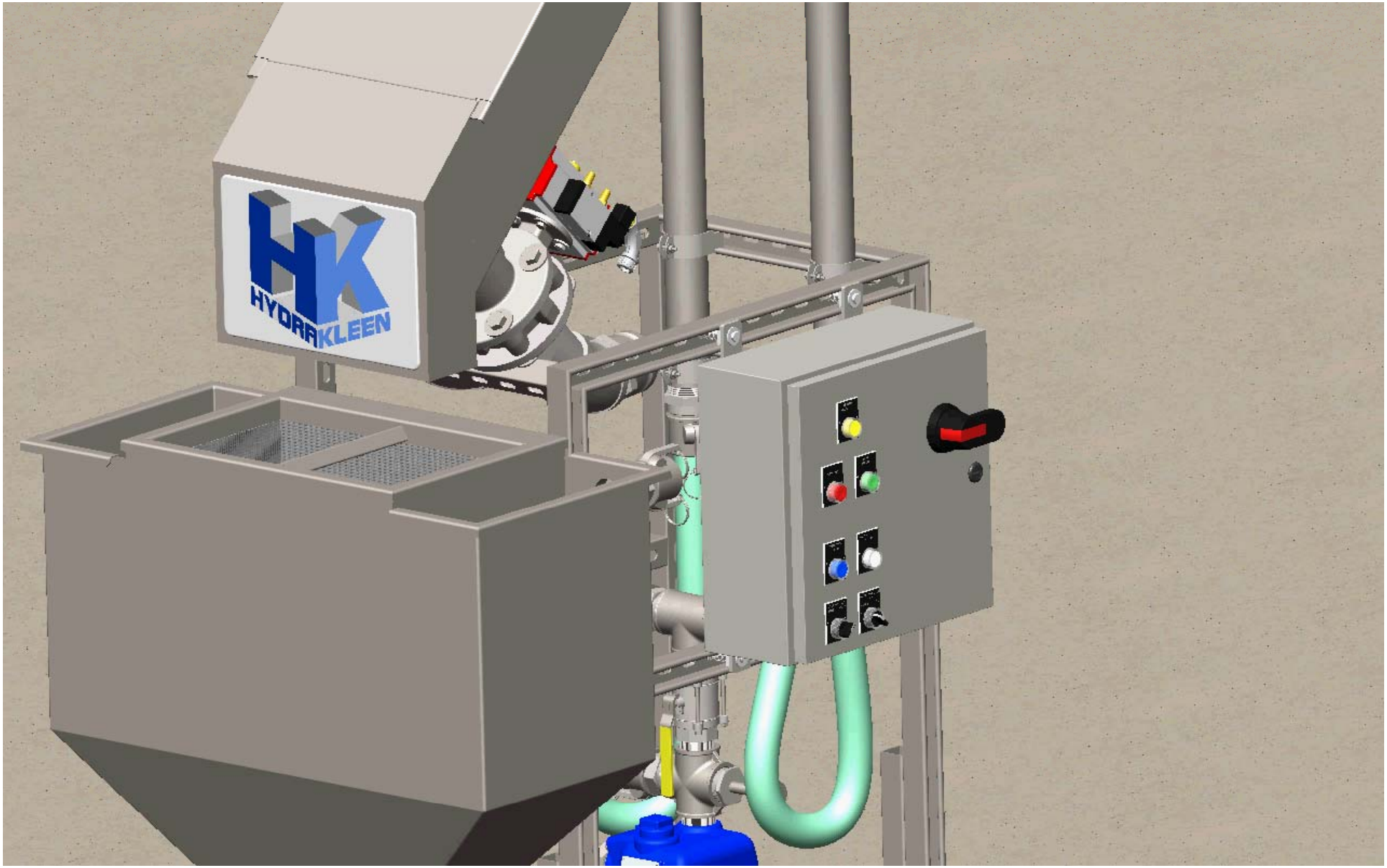
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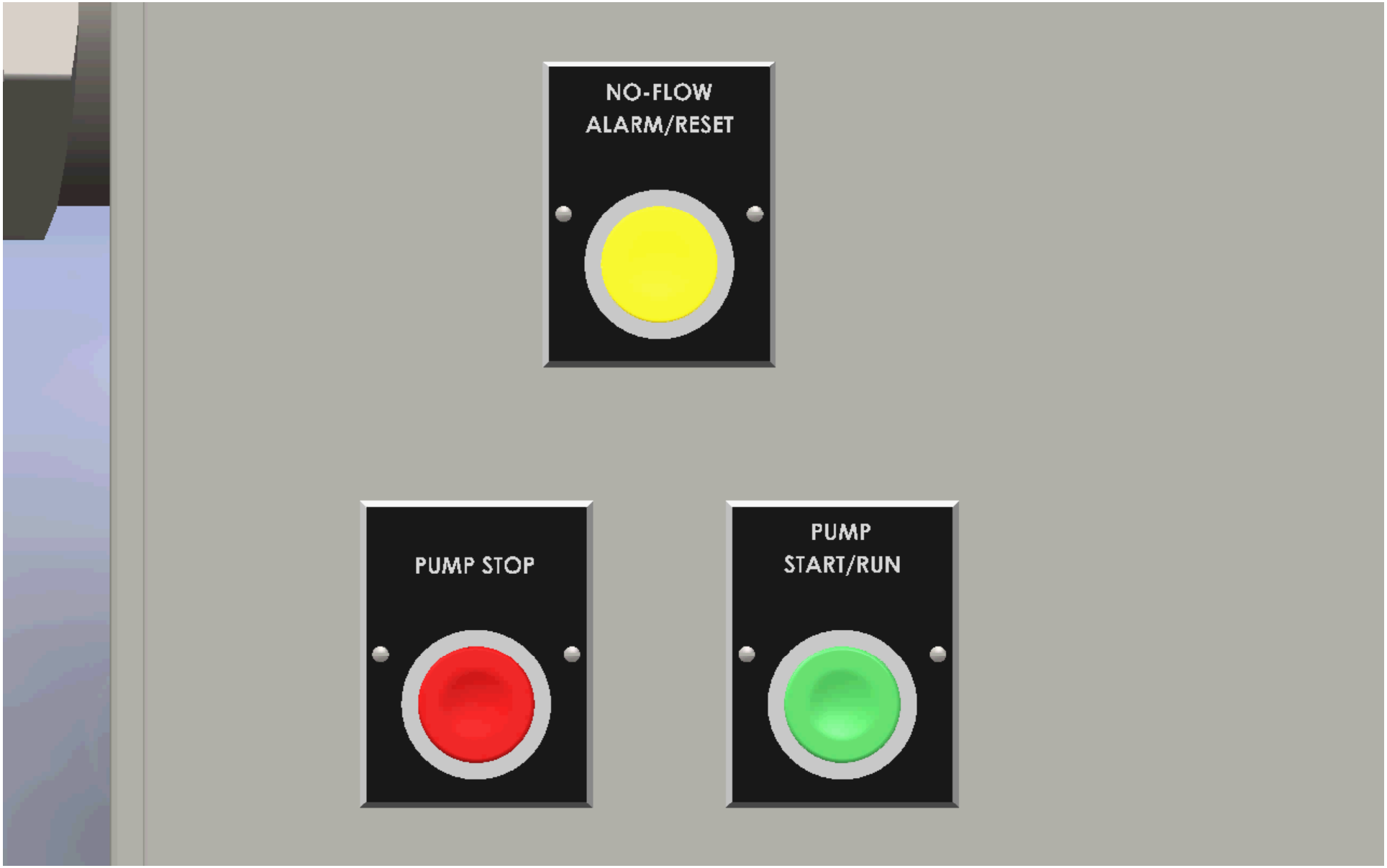
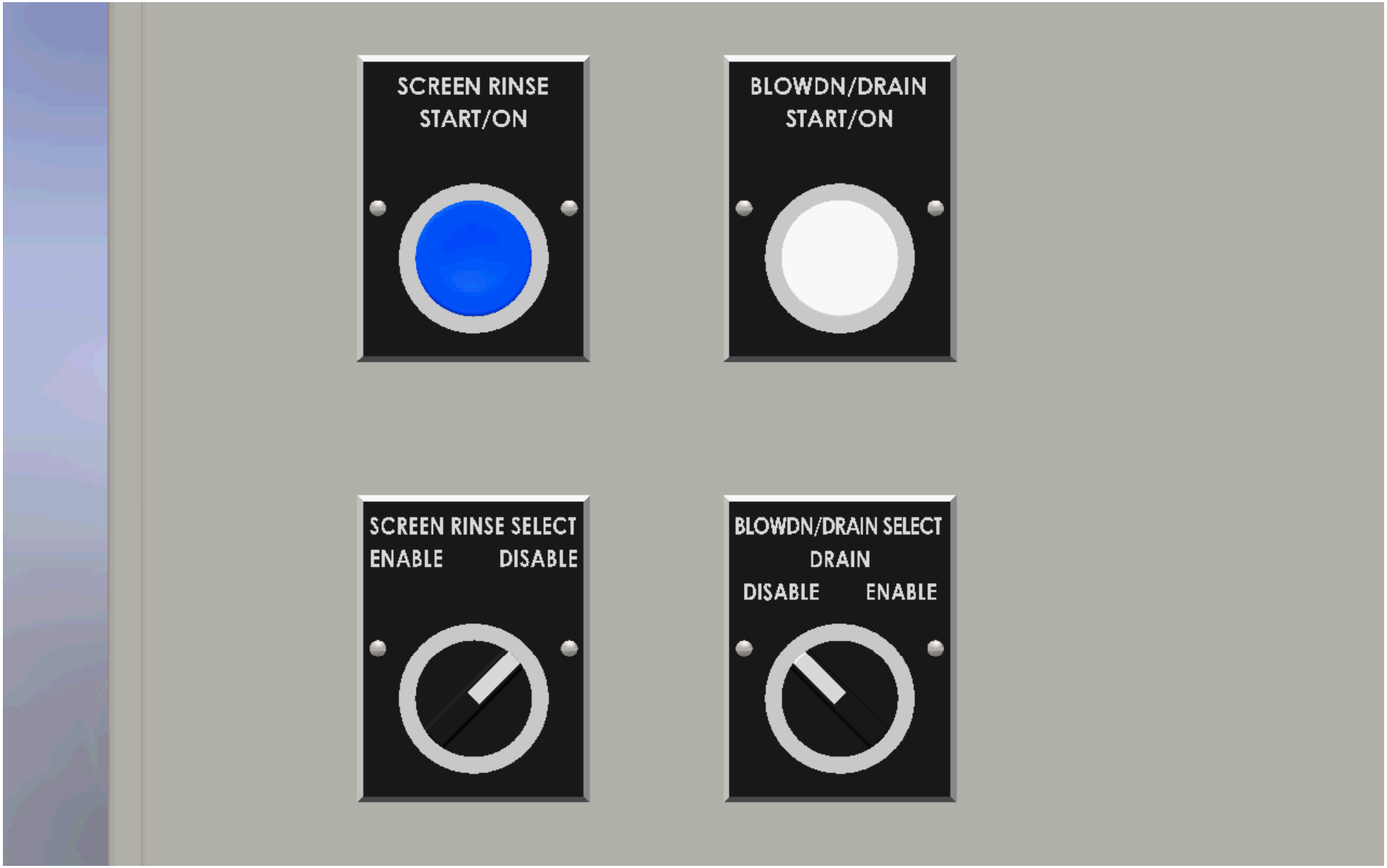
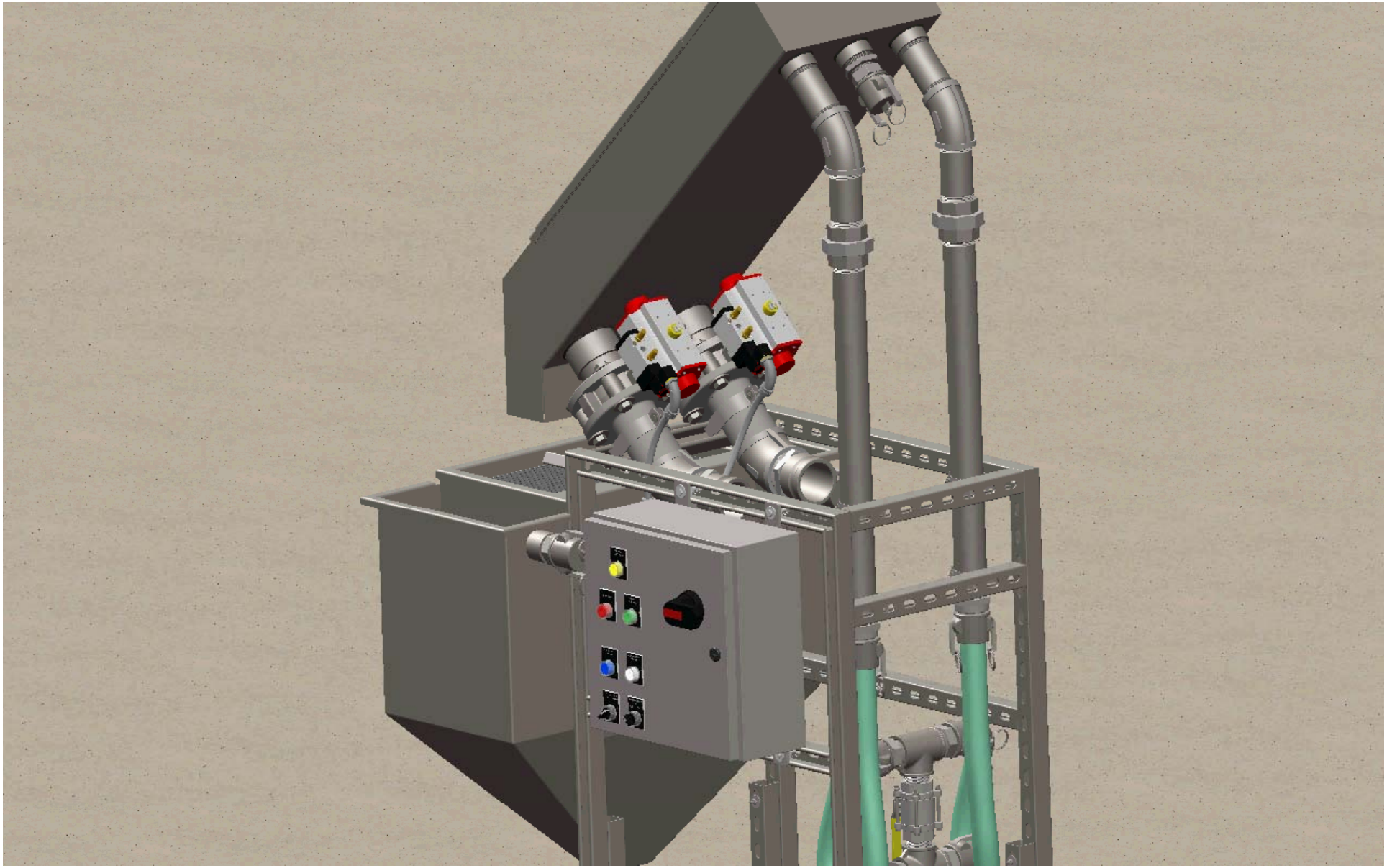
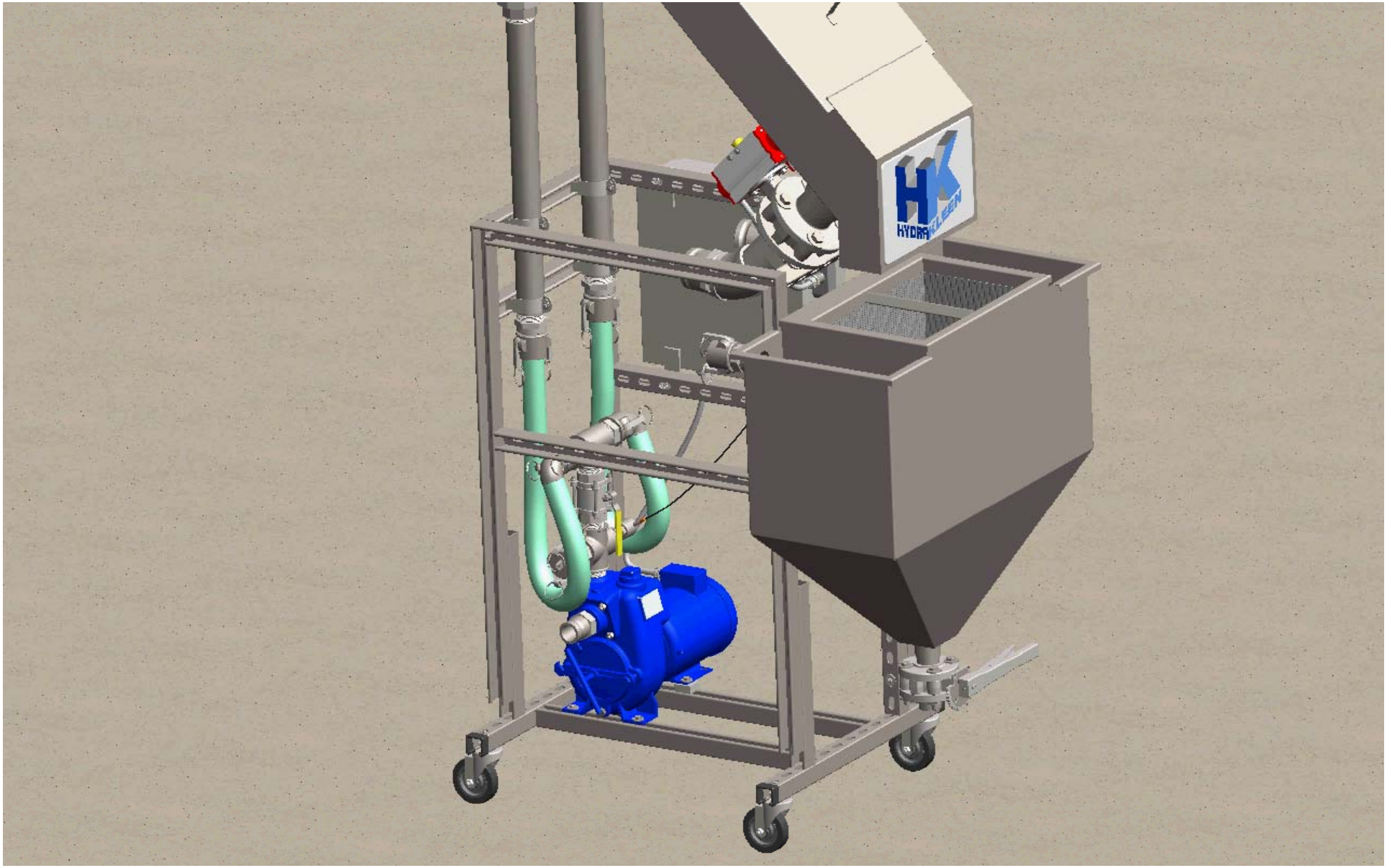

NO-FLOW
ALARM/RESET
PUMP STOP
PUMP
START/RUN


SCREEN RINSE
START/ON
BLOWDN/DRAIN
START/ON
SCREEN RINSE SELECT
ENABLE
DISABLE
BLOWDN/DRAIN SELECT
DRAIN
DISABLE
ENABLE

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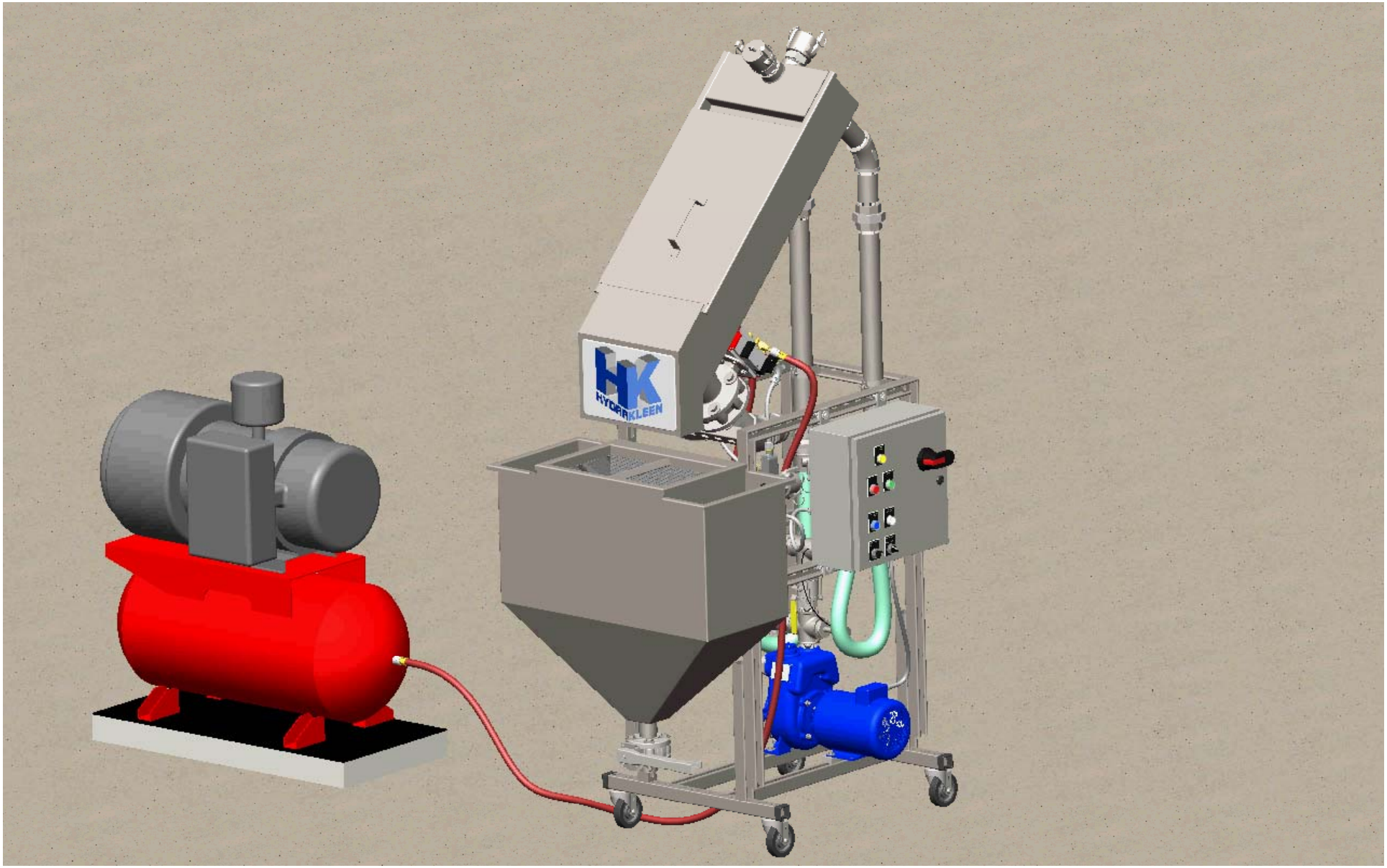
HYDRAKLEEN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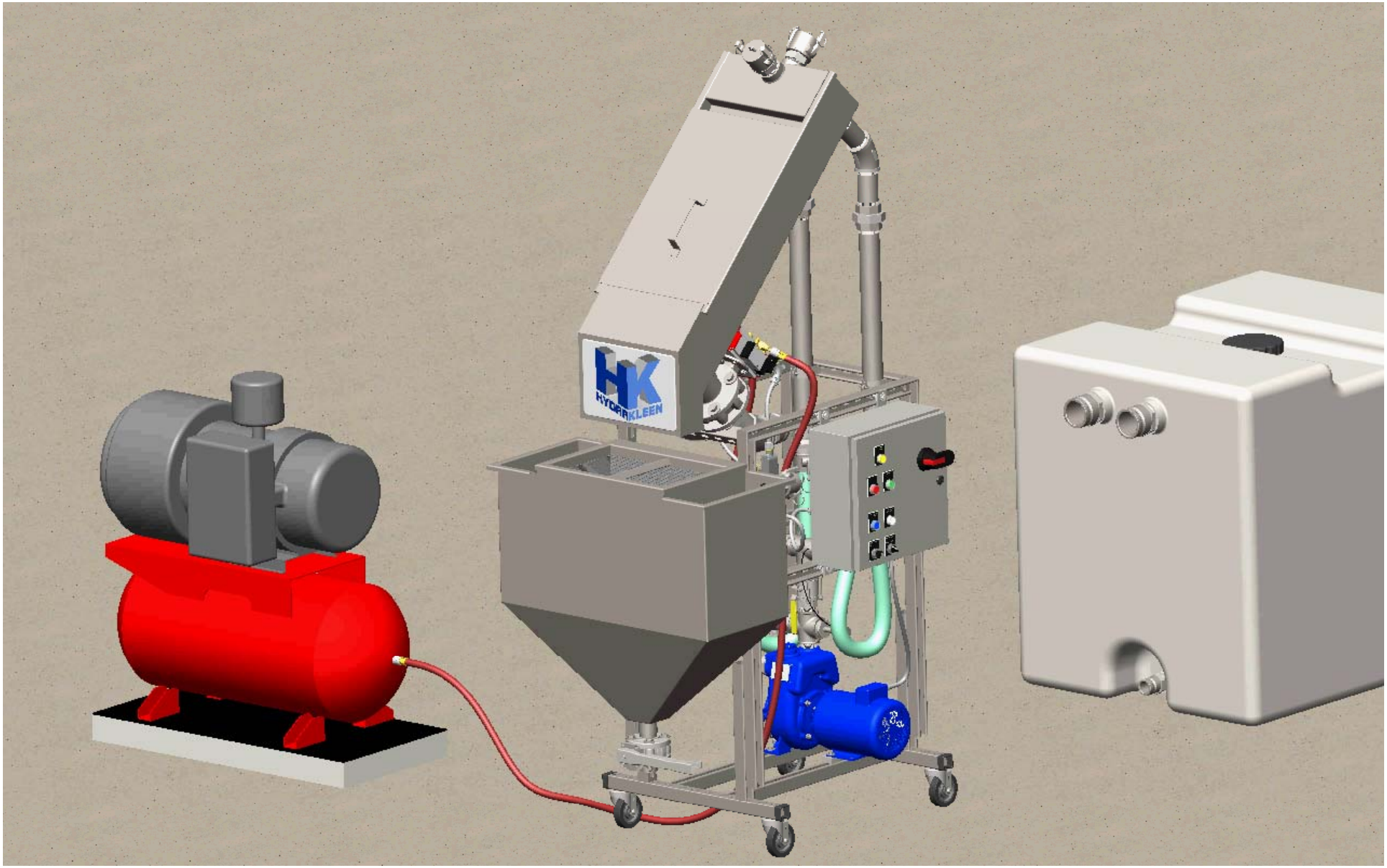
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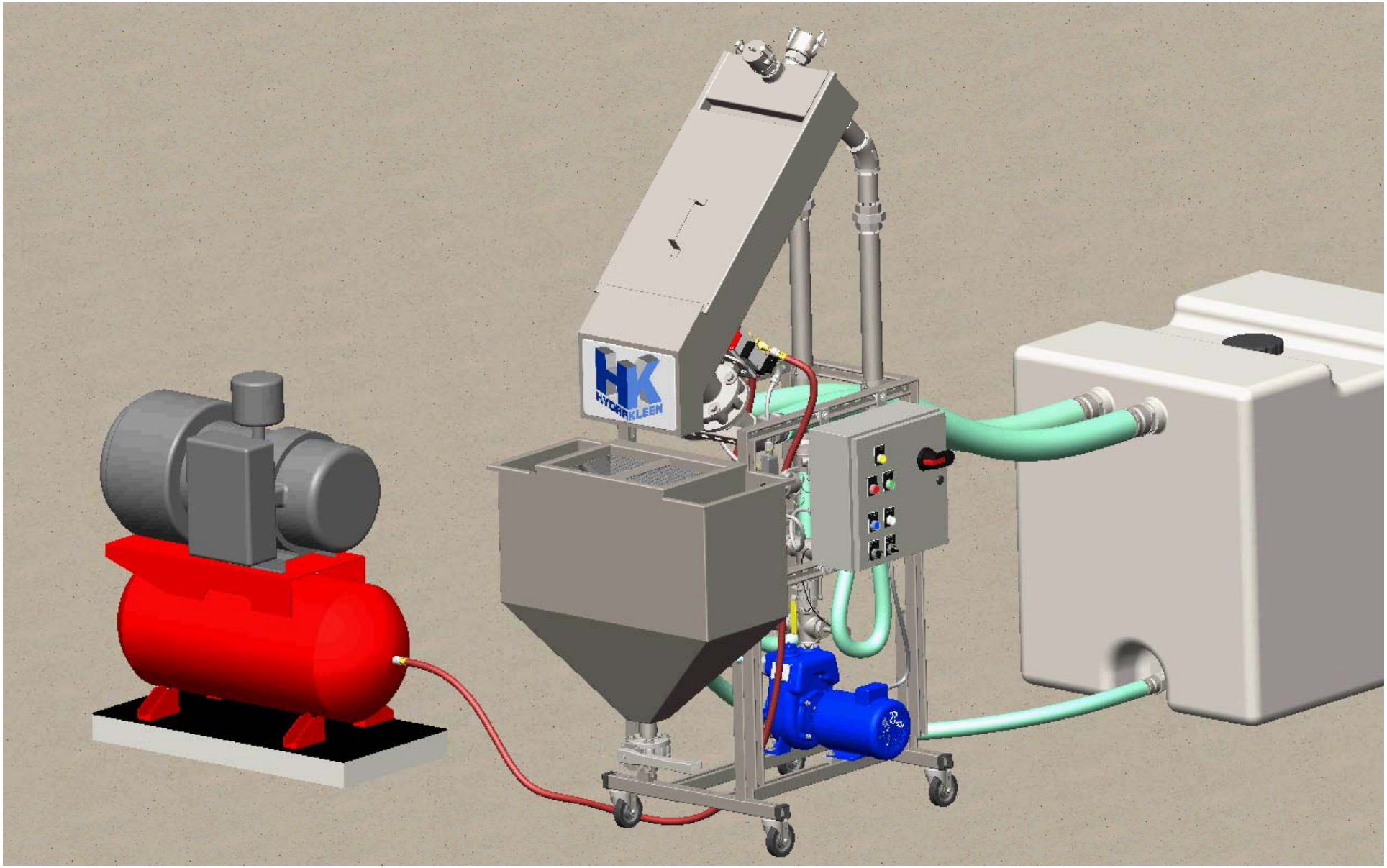
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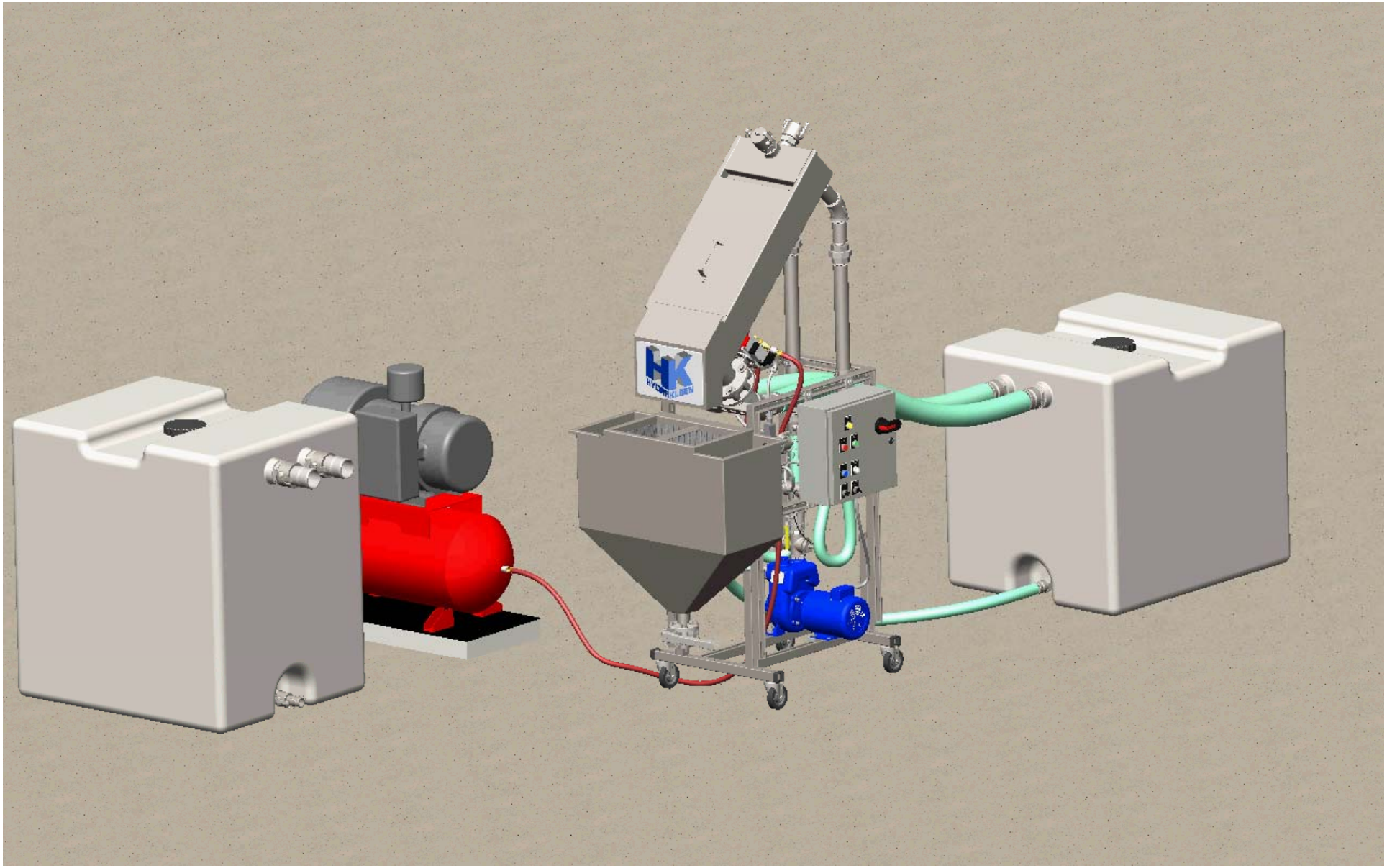
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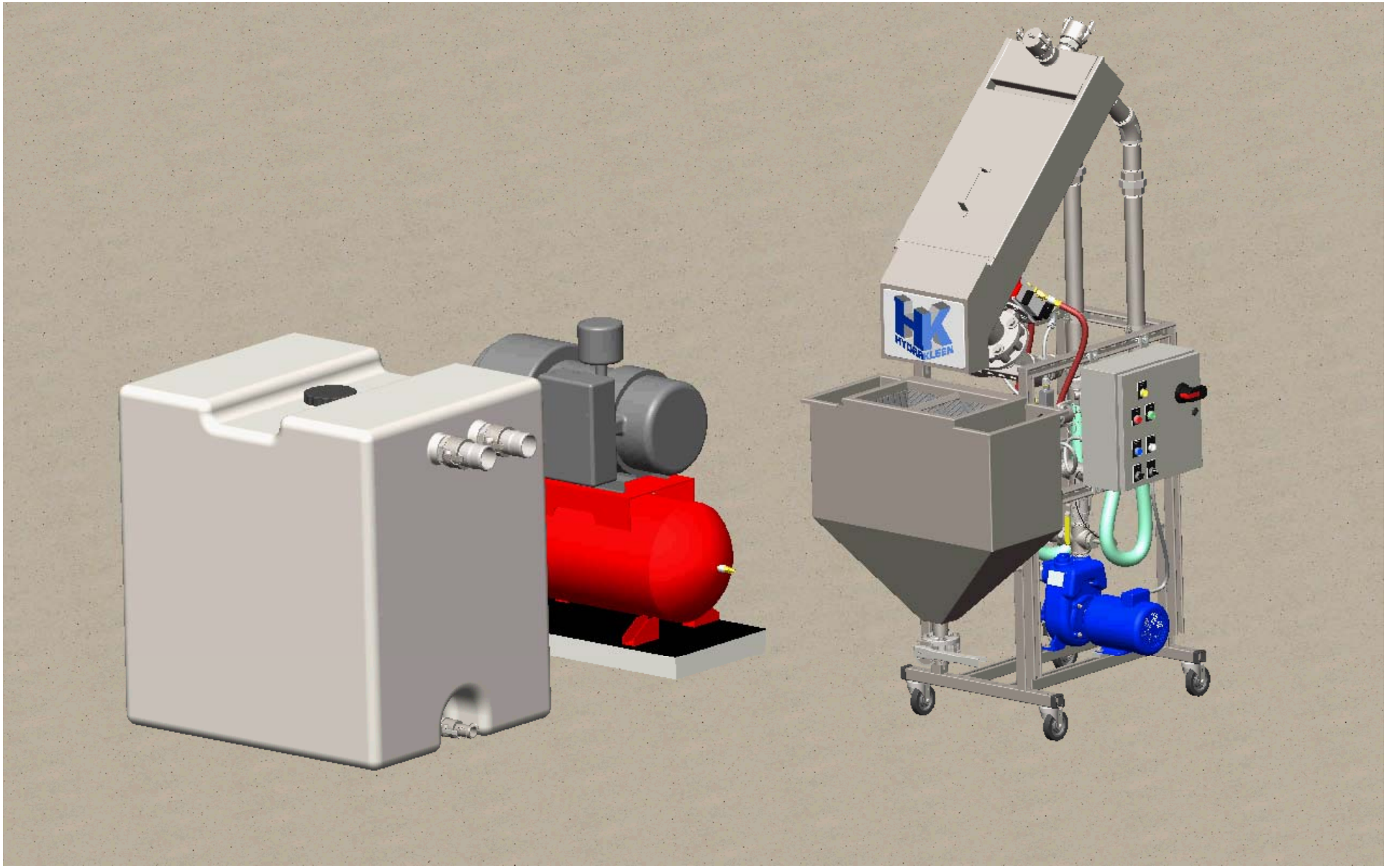
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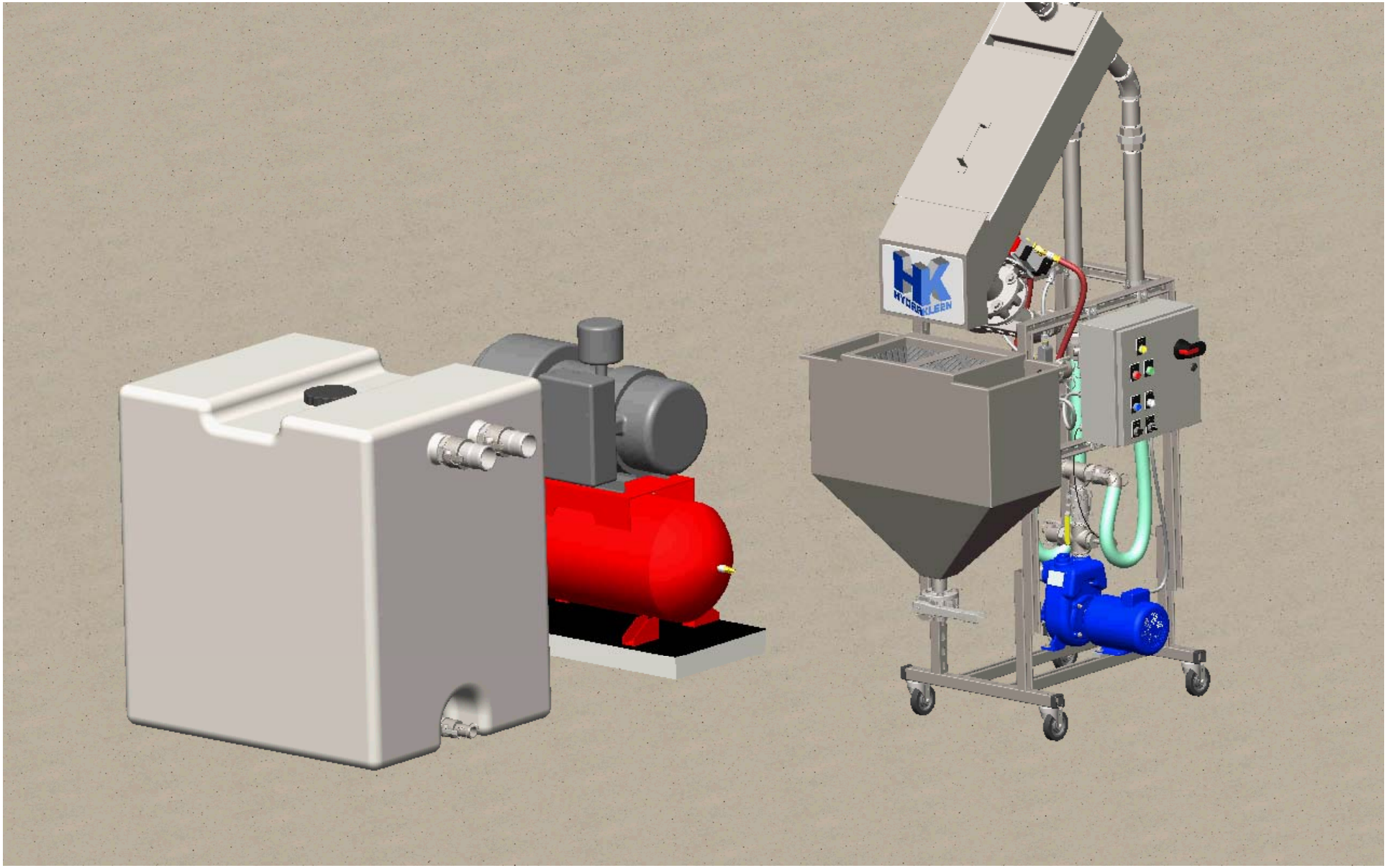
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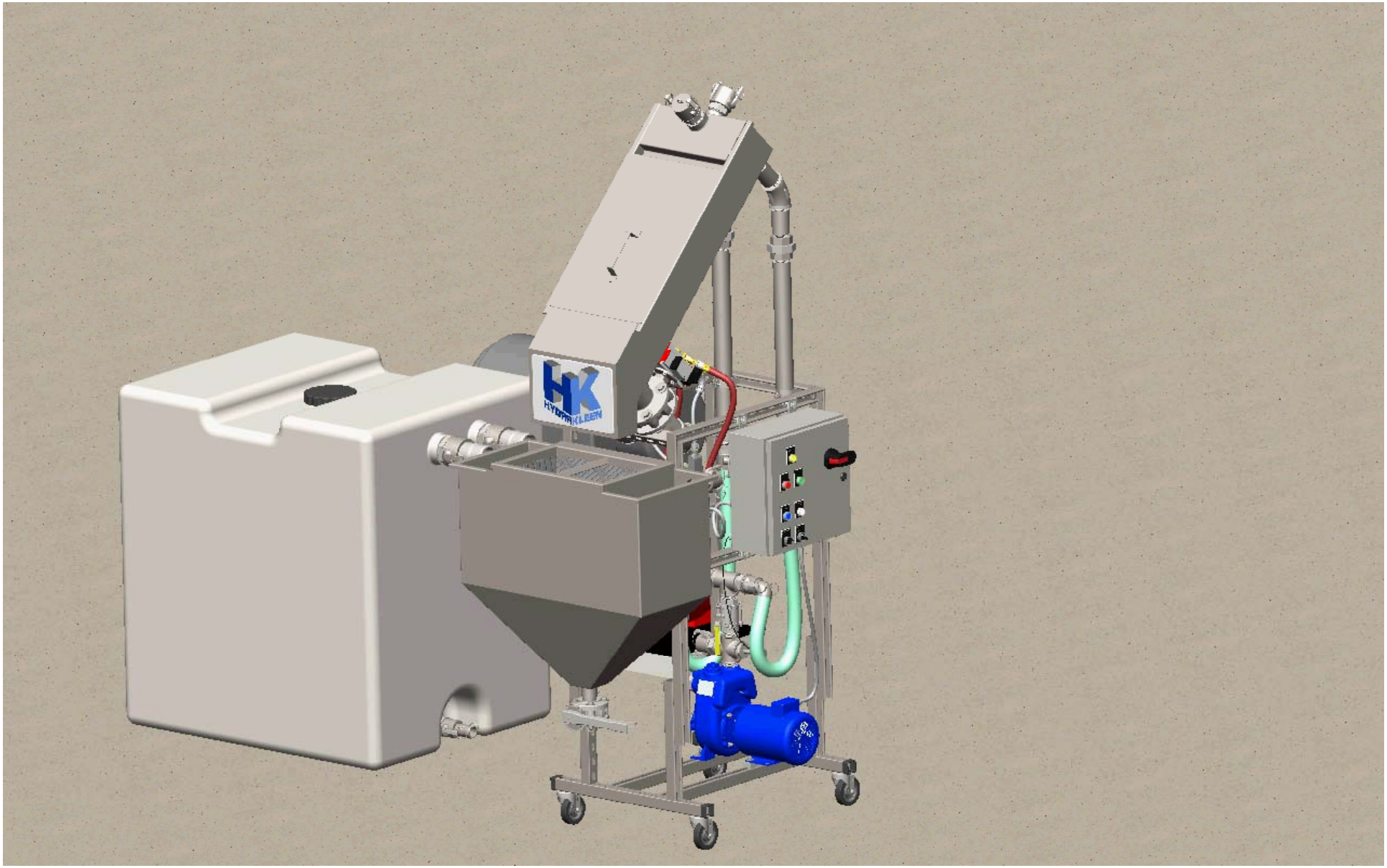
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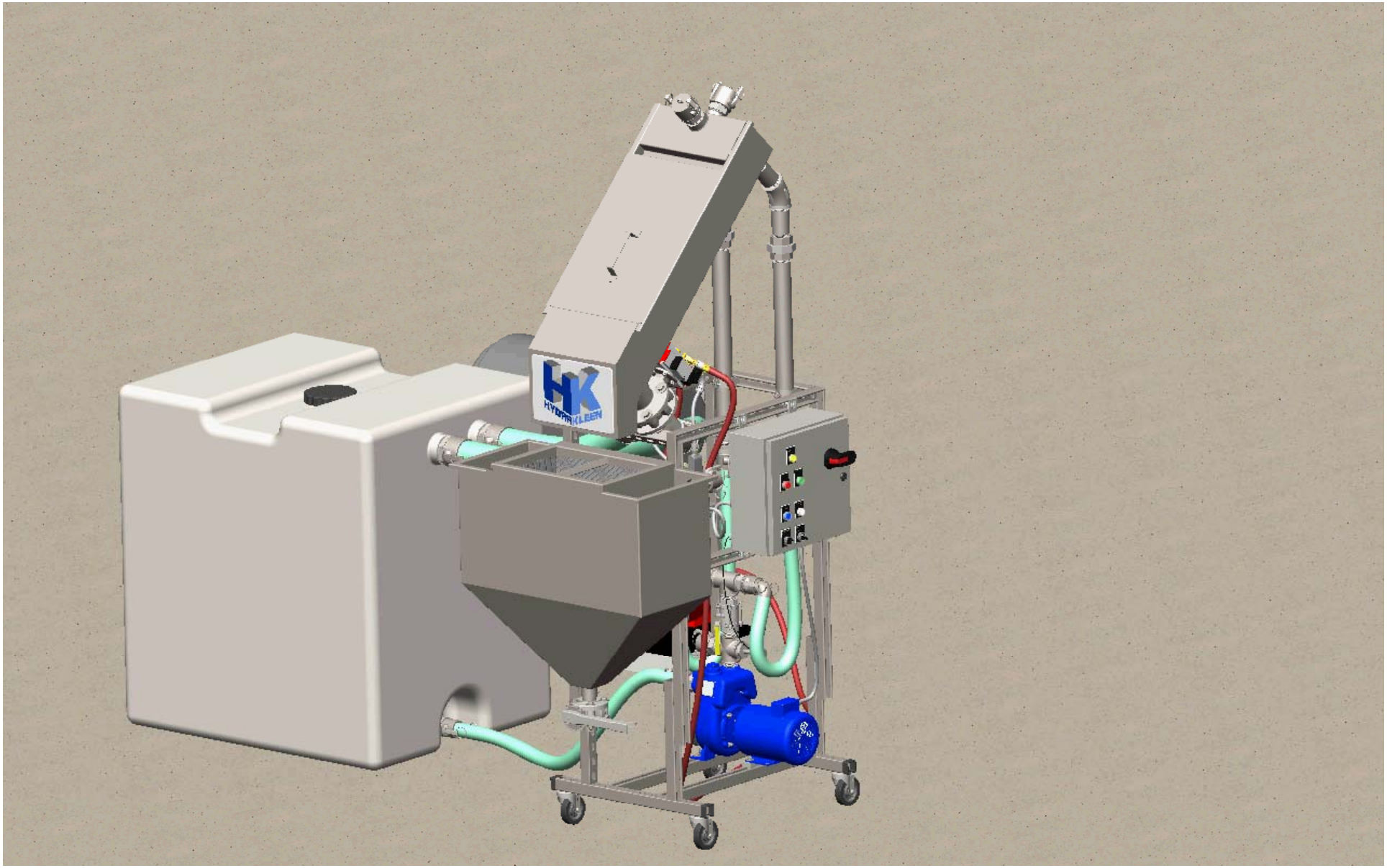

HK
HYDRAKLEEN

HK Applications

Industrial:

- Food & Drug; Canning, Bottling & Packaging; Beverage; Poultry, Dairy & Beef; Hog Farms & Washdown Waters
- General Manufacturing; Steel; Steel Wire Rope; Bearing Manufacturers; Aerospace; Pots, Pans & Caldrons
- Automotive; Remanufacturing; Parts Washers; Machine Tool Coolants; Cooling Towers; Raw Water
- Mining; Cement, Concrete & Mortar
- Plastics & Rubber; Inking; Paper; Textiles
- Oil Exploration; Petroleum; Petroleum By-products

Municipal:

- Drinking Water Supply; Wastewater Treatment

Commercial:

- Golf Course Irrigation; Farming & Agricultural Irrigation; Aquaculture; Car/Truck Washes

Mushroom Compost

National marketer of fresh mushrooms, supplying products for sale to supermarkets and foodservice operations

Petroleum Exploration

Seafood Processing

NELSON CRAB INC.
Premium Seafood Since 1934

Gourmet Canned Seafood shipped directly from the cannery in Washington State

Scrubber Towers

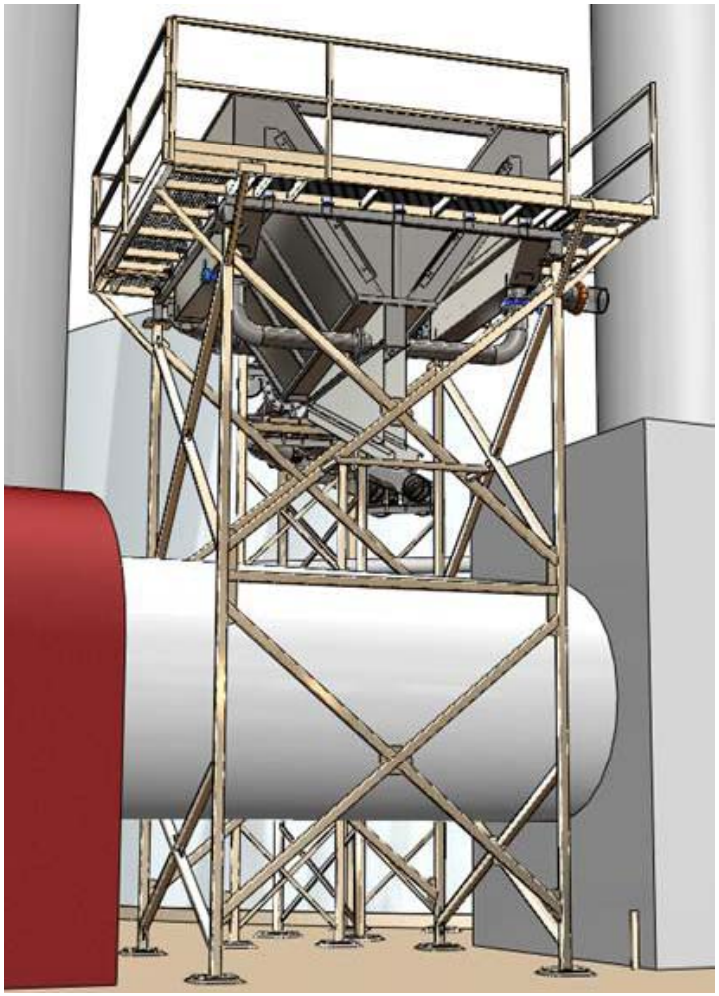
Air Pollution Abatement

Johnson Matthey

Johnson Matthey - a world leader in advanced materials technology

Animal Feeding Ops

Air Pollution Abatement
Pressed hardboard siding



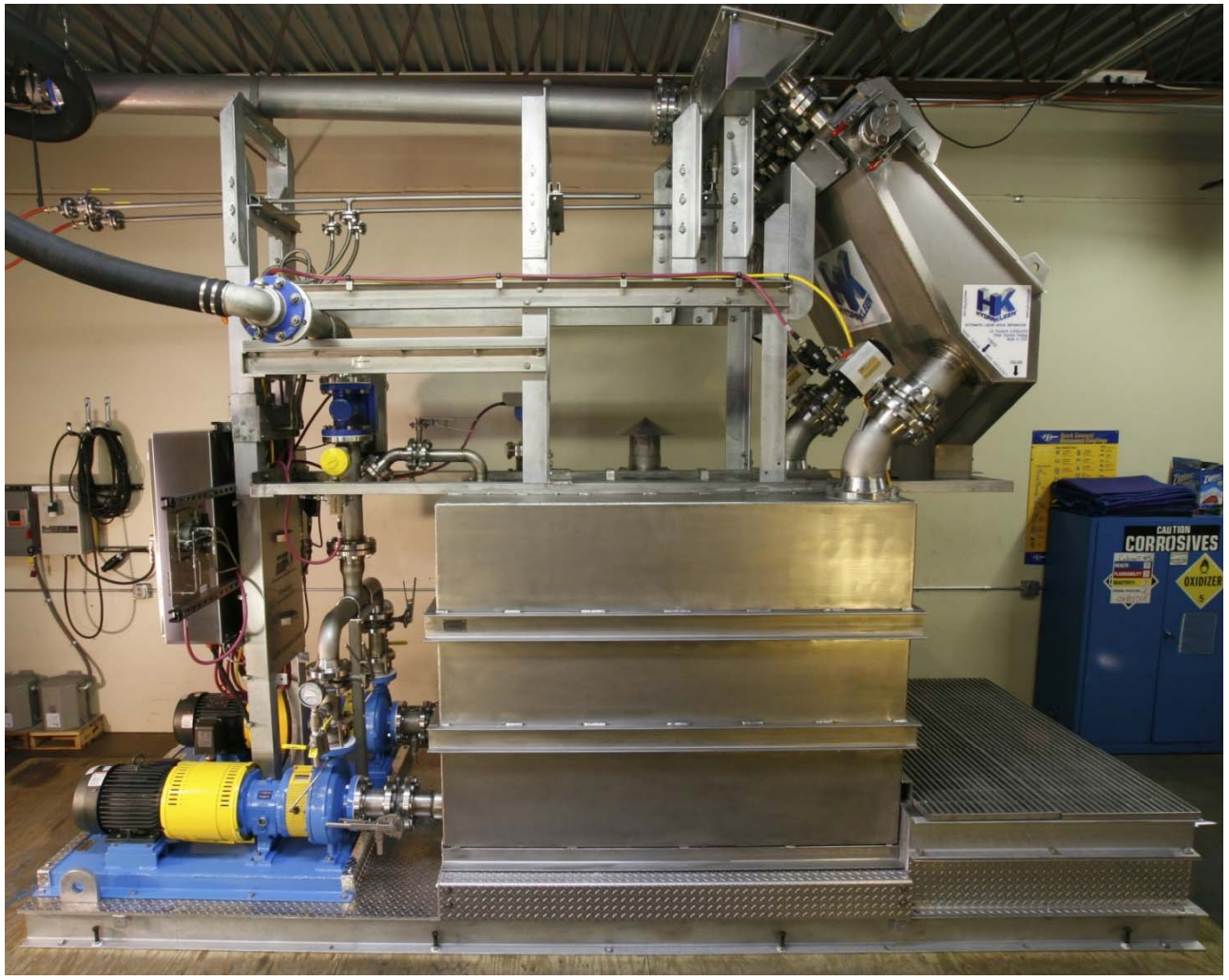
Compound Liquid-Solid Separator

Complete-Packaged Systems

Engineering · Procurement · Construction (EPC)

Custom Skidded Equipment

Packaged Liquid-Solid Separator



Petroleum by-products processing

Custom Skidded Equipment

Control & Pumping Station

Petroleum by-products processing

Hazardous Environment
Purge Pressurization Panels

Controllers

NEMA 4X

Ex-proof

Product Development

Food-Grade Screen Separators

Product Development

Food-Grade Screen Separators

Well Cleanout Fluids Management

Single-use fluids transport

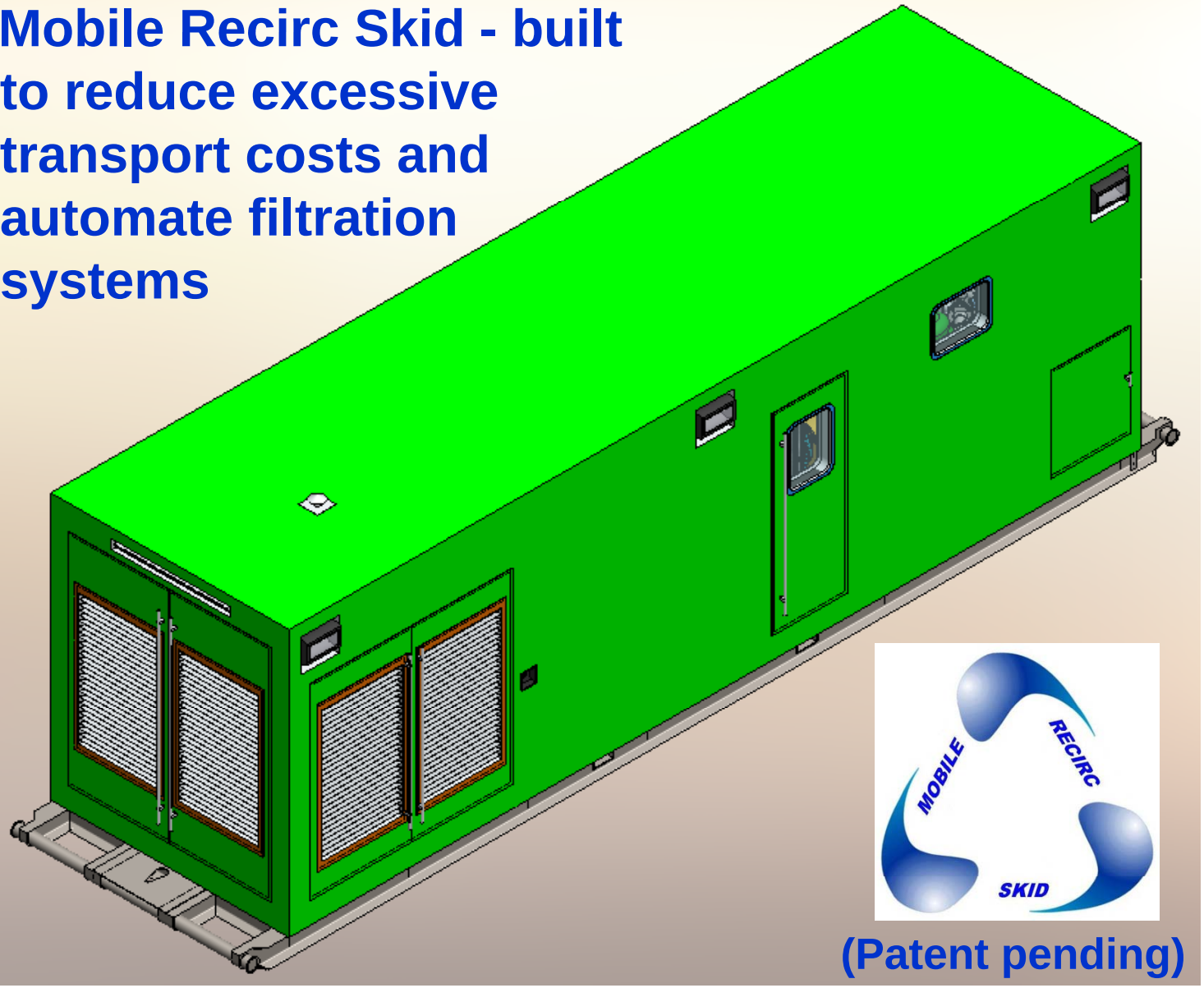
(existing)

Trailer-mounted filter pods

(before)

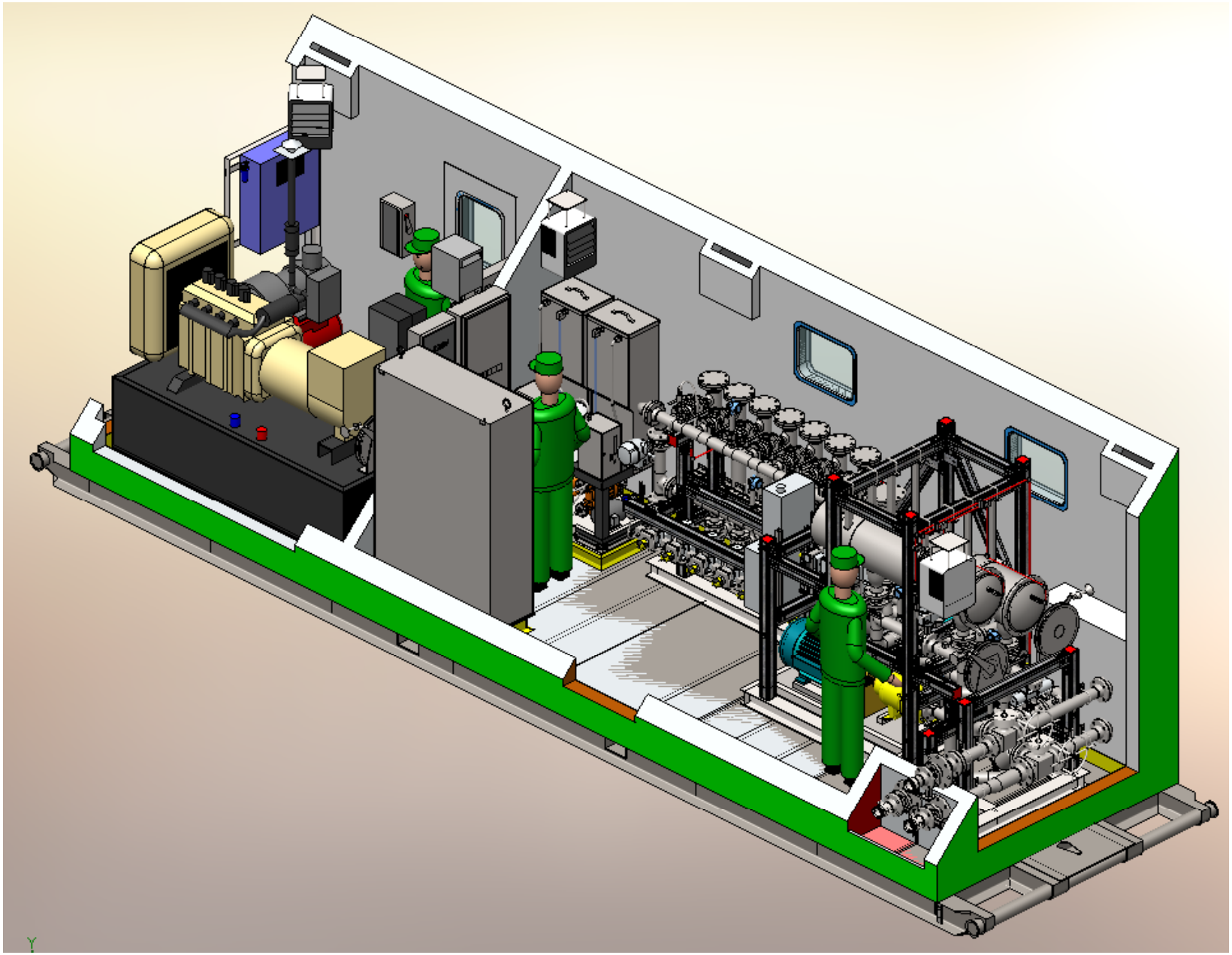
ARS Arctic Enclosure Iso View

Mobile Recirc Skid - built to reduce excessive transport costs and automate filtration systems

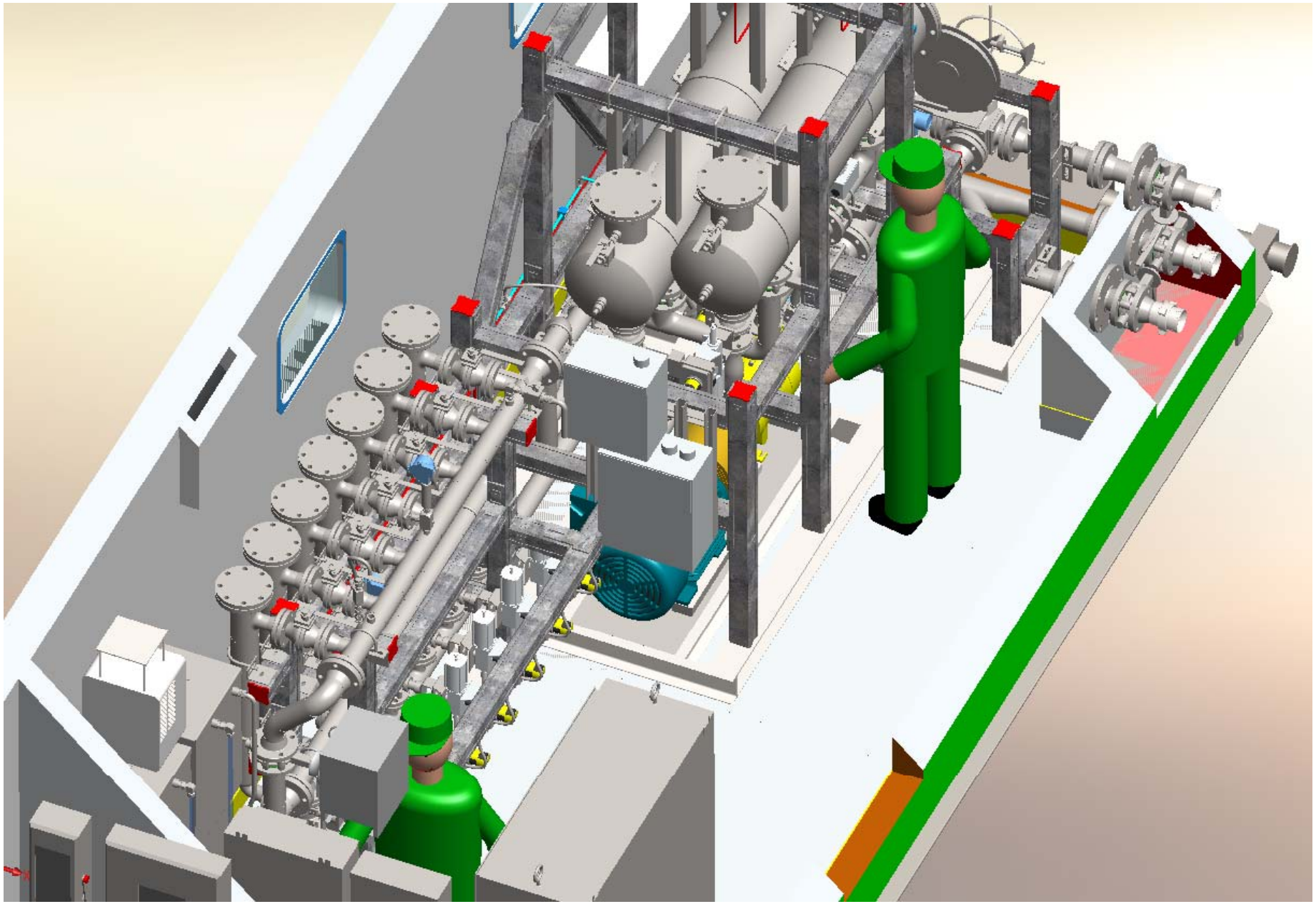


(Patent pending)

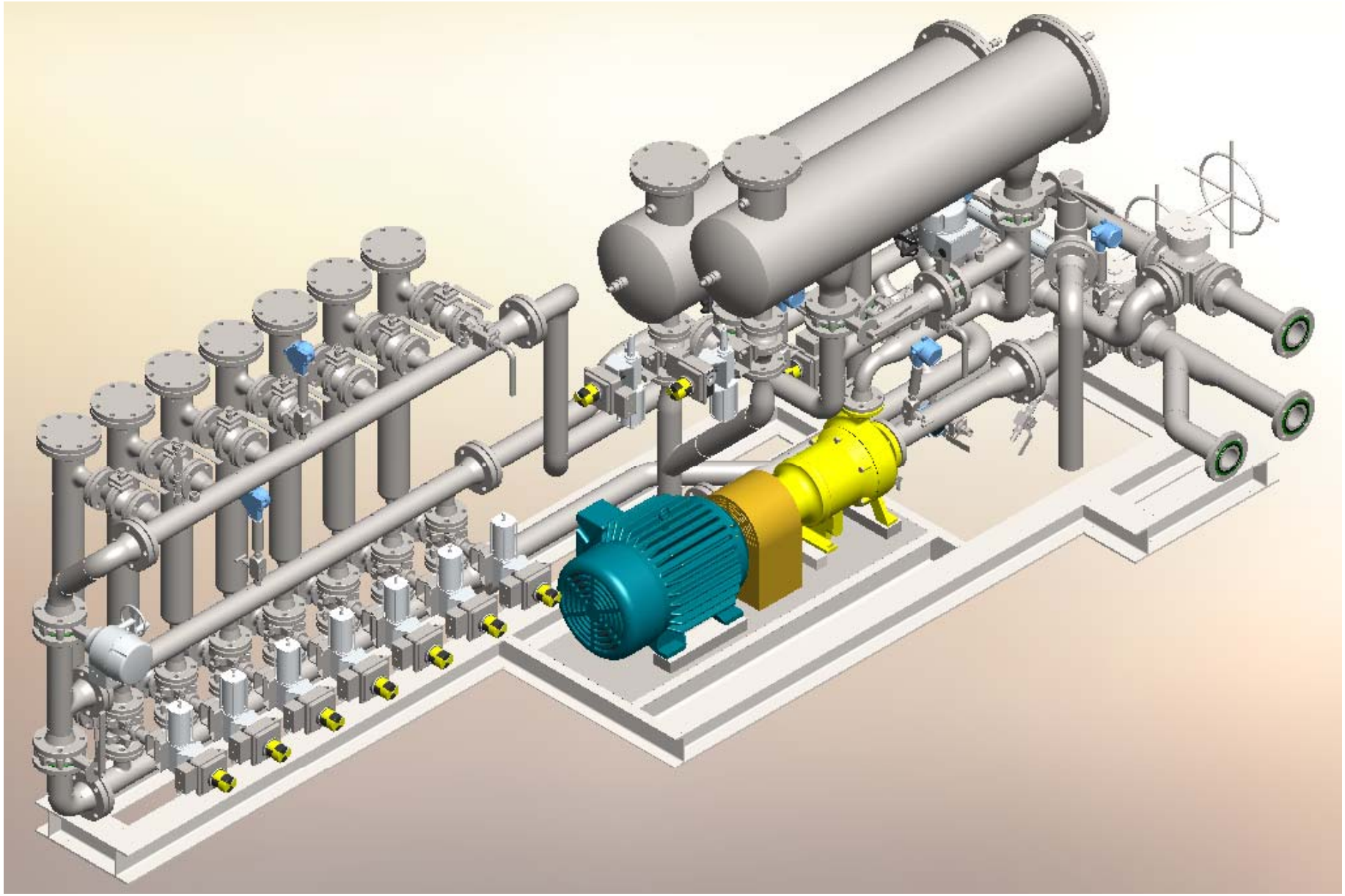
ARS Filter Room Cutaway



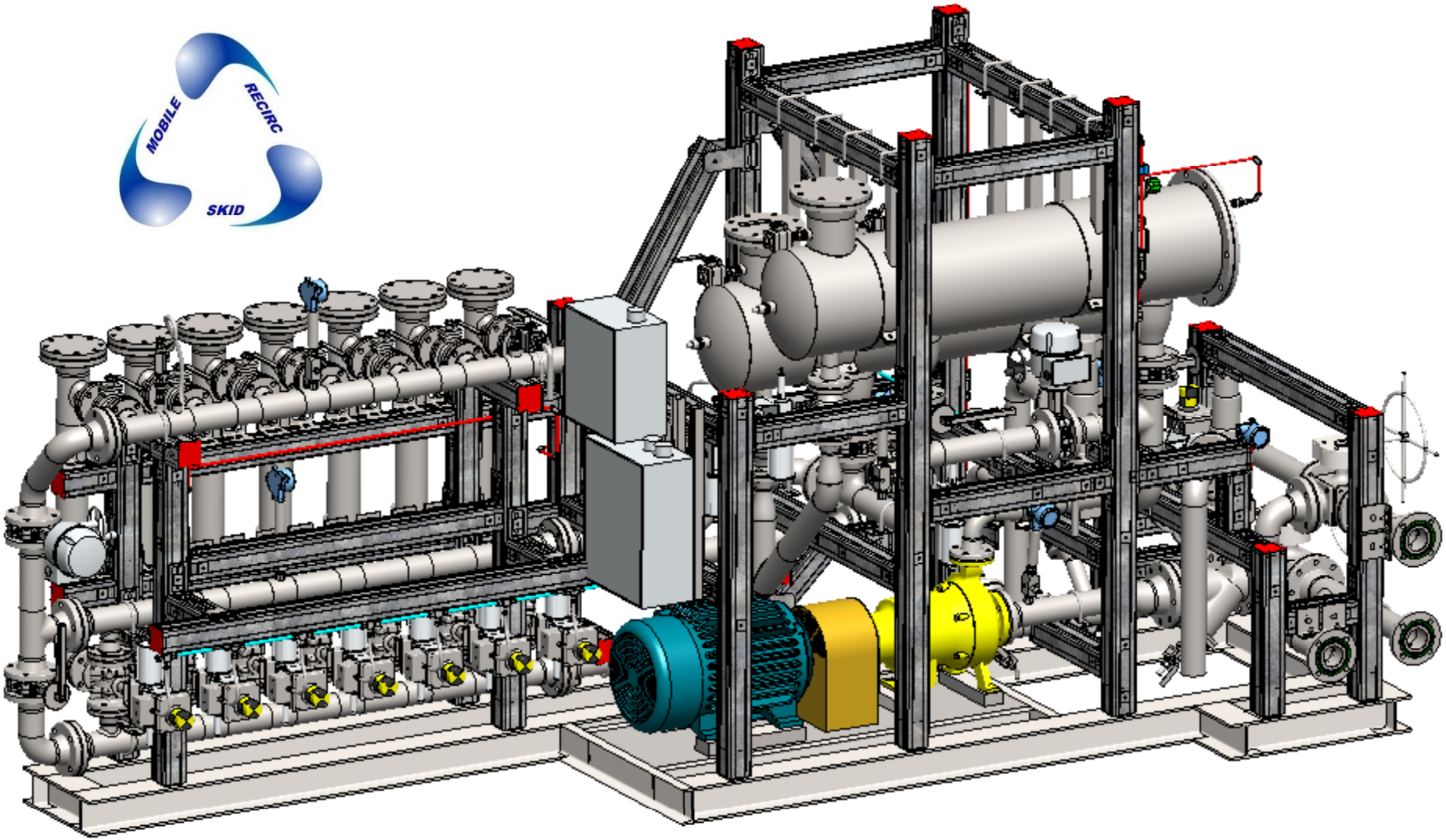
ARS Top Iso View



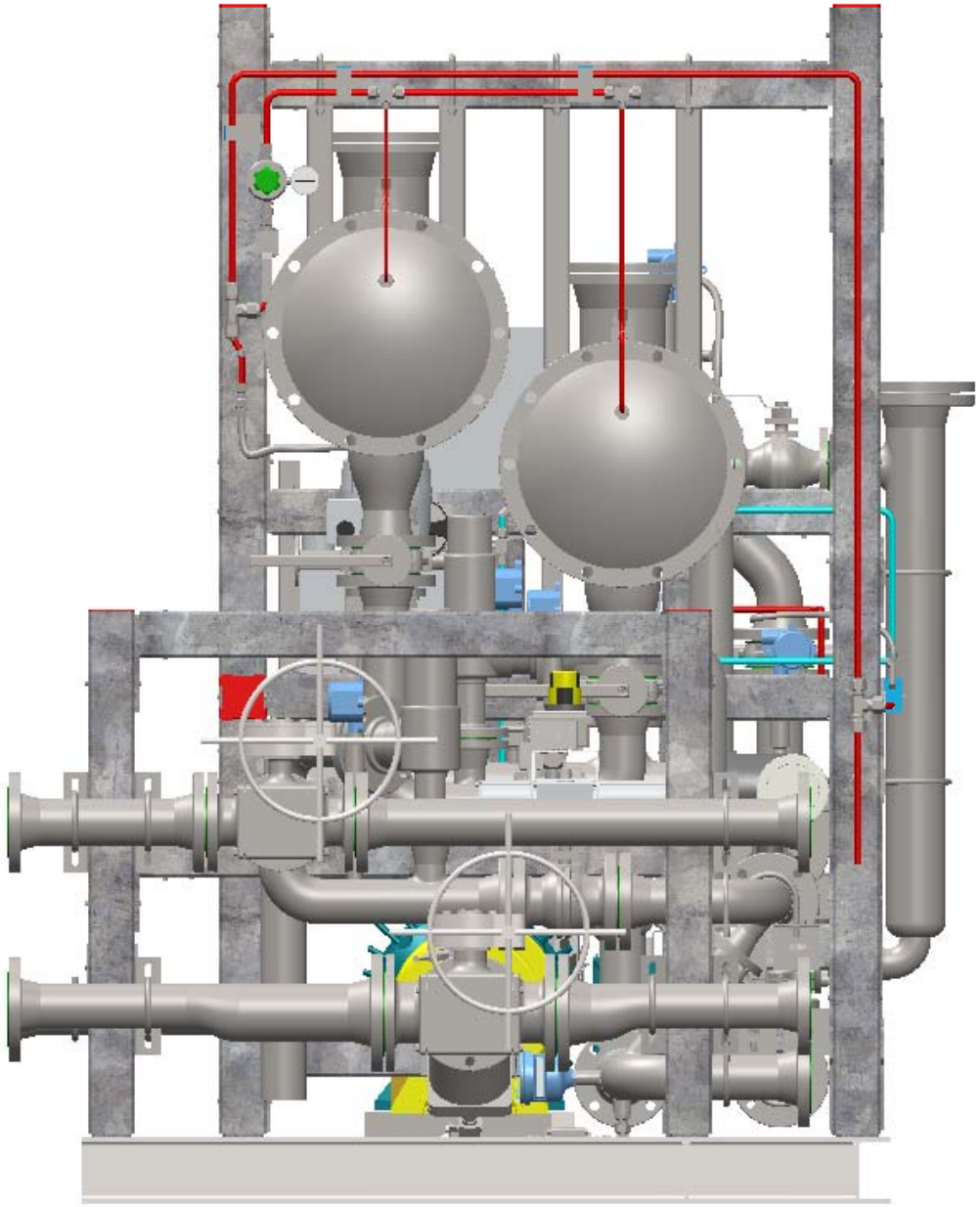
ARS Pump, Piping, Filters



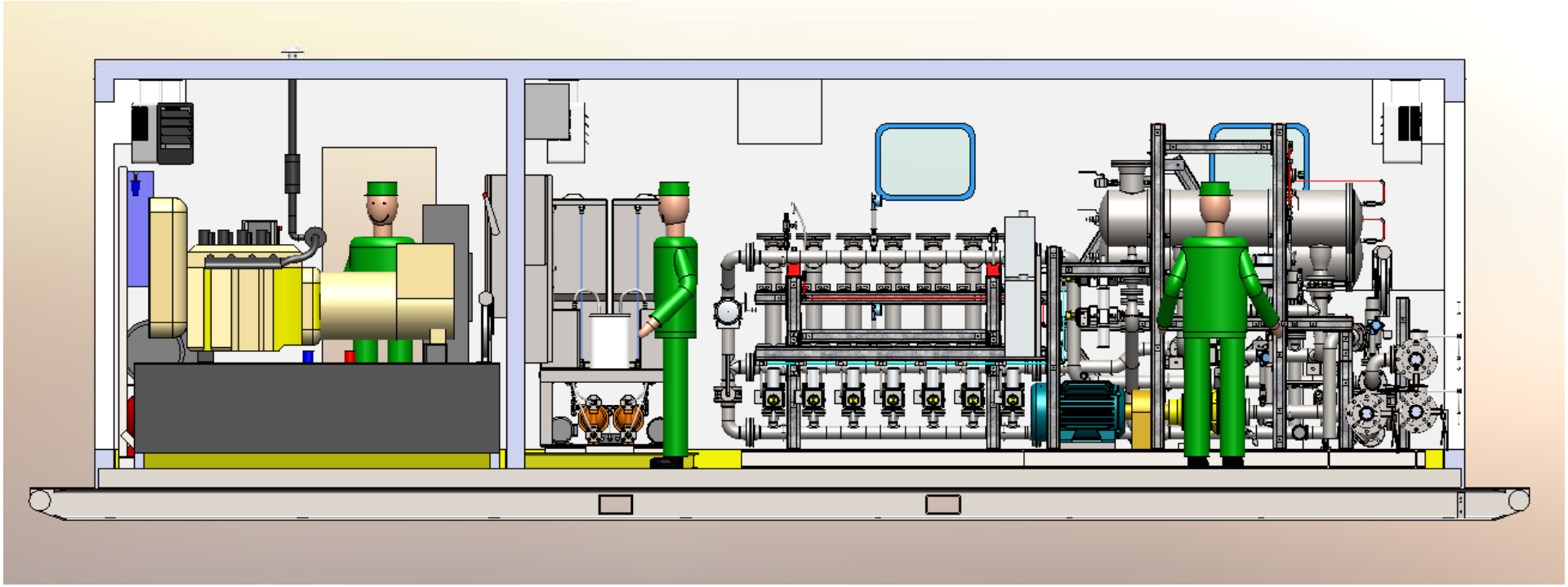
ARS Pump Filter Skid



ARS Filtration Skid Piping



ARS Arctic Enclosure Elevation



Engineering • Procurement • Construction

Turnkey Projects

Demonstration / Pilot Equipment

Laboratory Testing

On-site Trial Testing

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