INDUSTRIAL VACUUM LIQUID & WASTE WATER CONVEYANCE SYSTEMS IN CLEANROOM SYRINGE WASHING OPERATIONS & OTHER APPLICATIONS

Phil Crincoli
ISPE Product Show
Track 1, Session 1
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Phil Crincoli

Speaker Bio

- > Environmental Business for 20 years
- > 2 Tours of Duty with WM National Sales
- > Integrated Facility Management for 10 years
- > Former VP of IFMA-NJ
- > Member of ISPE since 2001. NJ/DVC Sponsors
- > Chemistry Council of NJ Committees
- > US Green Building Council – NJ
- > 40 Hour HAZWOPPER in 1993
- > LEAN Certification in 2015
- > Joined Airvac in 2017 as Ind. Segment and Maritime Sales Manager

HOW IT WORKS

Vacuum Liquid Conveyance Systems

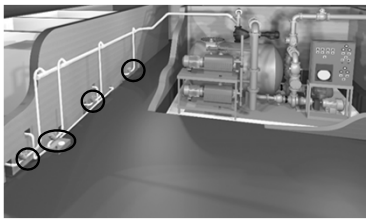
Industrial Applications

- > FDA Regulated and Food Processing Facilities
- > Manufacturing Sites (Steel, power & Chemical Plants)
- > Leachate Control Systems at Landfills
- > Brownfield Site Construction
- > Green and LEED Projects (Solvis & Calamigos)
- > Stadiums, exhibition halls & Arenas
- > Transportation: Trains, Planes, Cruise Ships

Vacuum Liquid Conveyance Systems

How It Works

- Liquid flows from facility sources to various evacuation units
- Normally closed pneumatic interface valve opens & constant vacuum within the piping pulls liquid into the pipe
- Vacuum station applies negative pressure to the small diameter piping network & centrally collects the liquid
- Multiple waste streams can be collected & discharged separately
- Basic principles + proven reliability = effective solutions



EVACUATION UNITS

Vacuum Liquid Conveyance Systems

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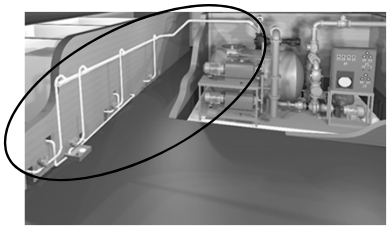
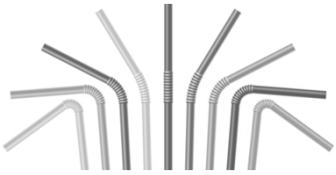


PIPING NETWORK



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VACUUM STATION

Vacuum Liquid Conveyance Systems

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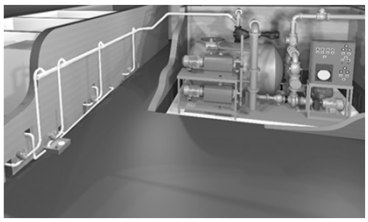

MULTIPLE WASTE STREAMS

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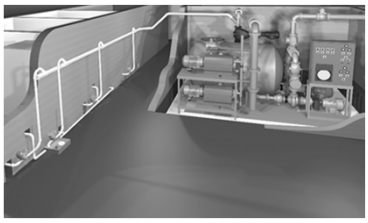


SOLUTION

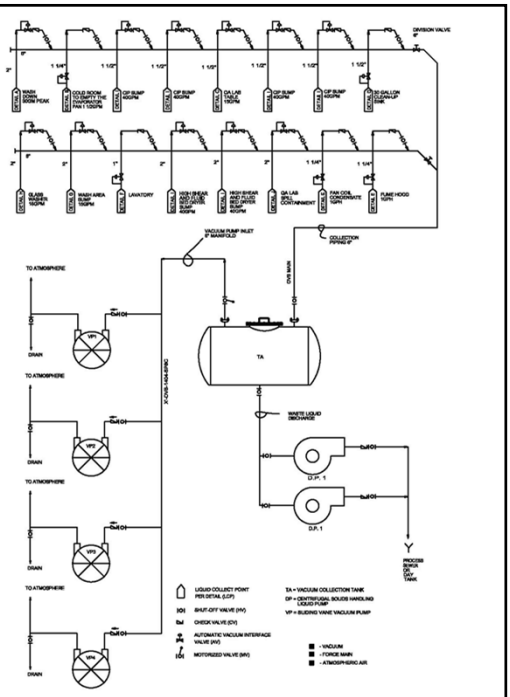
Vacuum Liquid Conveyance Systems

Key System Advantages

- Vertically lift liquid 20'+ without electricity at the source
- Eliminate blockages due to high scouring velocities
- No infiltration or exfiltration into/from piping
- Construction duration up to 60% shorter & installation COST less than gravity as piping can be installed in walls & ceiling
- Separation of Contaminated Liquids
- Maintenance outside Controlled Environments
- Indoor, Outdoor and Integrated Systems

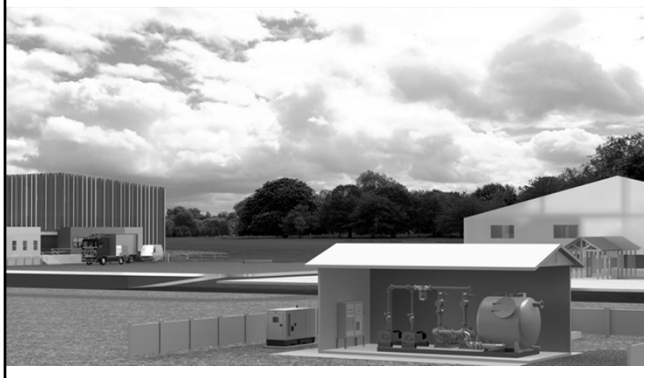
Vacuum Liquid Conveyance Systems

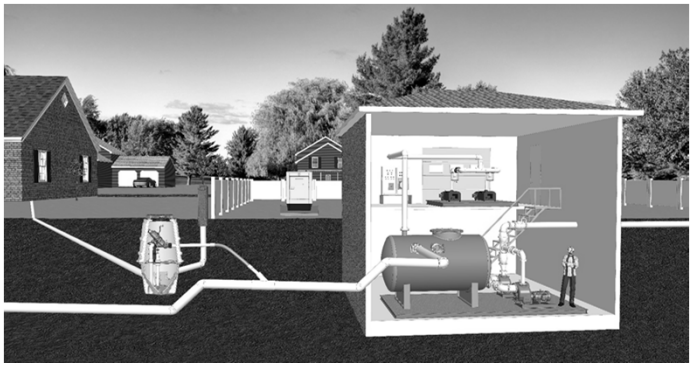
Sample Layout Design



Vacuum Liquid Conveyance Systems

Outdoor Systems





PROBLEM SOLVING

Case Study

Merck (Cleanroom) – Validated Environment

Background

> One of the largest vaccine manufacturing sites in world

> Location undergoes frequent renovation

> Syringe Washing operation in Cleanroom (Gardasil, Hep C)

> Needed wastewater conveyance system to separate streams

Situation

> Cleanroom in tight space would not allow gravity system

> Access to area limited & many obstacles in place

> Zero tolerance system leaks & no room for dual containment

Case Study

Merck (Cleanroom) – Validated Environment

Solution

> Piping & system controllers placed in walls/ceilings/attics

> Separation of chemical & biological streams in 3 vats

> Single vacuum source maintains negative pressure - no leaks

Case Study

Roche-Basel, Switzerland (Labs & R&D)

Background

> New 10 floor facility w/ modular design for frequent changes

> Over 70 small labs & 4 large full floor labs, office, R&D

> High visibility state-of-art campus in downtown Basel

Situation

> Areas can be changed from office to lab to R&D

> All furniture, basins are movable

> Moves allow for easy hook ups and change outs

> S3 Level (BSL 4) in certain areas includes air burned

Case Study

Roche-Basel, Switzerland (Labs & R&D)

Solution

> 270 vacuum floor drains installed allow optional usage

> 12 autoclaves in basement also on vacuum

> 2 vacuum stations supply negative pressure for building

Case Study

Leidos Corporation-Boyers, PA (R&D Lab)

Background

> Facility is located 220 feet underground

> Leidos needed a highly secure R&D facility for experiments

> Former division of SAIC Corporation

> Location is part of Iron Mountain high security facility

Situation

> Due to facility depth, no gravity option on wastewater

> Minimization of wastewater discharge due to cost

> Sustainable solution that recycles almost all water on site

Case Study

Leidos Corporation-Boyers, PA (R&D Lab)

Solution

> The vacuum system hooked to bioreactor treatment

> All lab & gray water, & most of black water recycled on site

> Small filter sludge disposed offsite

Case Study

Eli Lilly-Eco Services (Solvay)-Kimberly Clark (underground)

Background

> Major firms in pharmaceuticals, chemicals & manufacturing

> Locations in Indiana, Louisiana and Alabama

> Systems boast longevity and reliability

Situation

- Excavation of these older sites was not safe or practical
- Site challenges included high water table, underground hazards: unknown utilities, buried chemicals and areas of high truck traffic subject to frequent ground shifting

Case Study

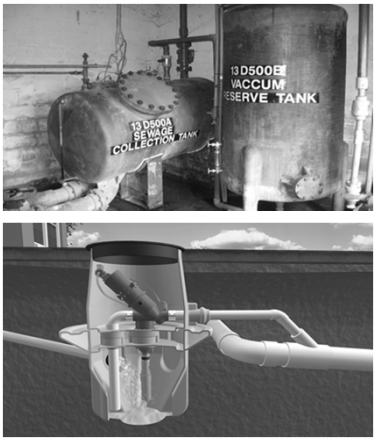
Eli Lilly-Eco Services (Solvay)-Kimberly Clark (underground)

Solution

> Vacuum sewage systems tie in multiple buildings

> The system conveys all wastewaters (Black & Gray)

> Our systems have been operational since the 1970s



Case Study

Calamigos Ranch, Malibu, CA (Net Zero Project)

Background

> 200 acre privately owned Ranch that serves as Corporate Conference Center, Movie Set and Amusement Park.

> Rapidly deteriorating ecological problems include decreasing fresh water table with groundwater pollution seeping into ocean, creating unsafe & unhealthy conditions along coast.

Situation

- Sources of fresh water decreasing and pollution increasing
- Calamigos wanted a practical, yet fully sustainable solution with a Net Zero goal

Case Study

Calamigos Ranch, Malibu, CA (Net Zero Project)

Solution

> The vacuum system pilot will modernize & centralize sewer system

> Hydrogen House will provide on site Bio treatment of Black water with recycled sludge, Gray water will be reused and energy supplied will be via fuel cells and solar energy

Case Study

Pratt & Whitney (Stantec), Montreal, Canada

Background

Pratt & Whitney operates a catastrophic test burn facility in Montreal Canada for determining integrity duration of jet engines, should they catch on fire during flight operations. Once test burning is complete, the jet engines are extinguished with combination of fire retardants and water.

Situation

Stantec was selected for construction of wastewater collection area to protect sensitive environmental areas, that will segregate the liquids contaminated with jet fuel, water and fire retardants, which could exceed 26K gallons over 5-10 minutes.

Case Study

Pratt & Whitney (Stantec), Montreal, Canada

Solution

The vacuum system replaces the existing gravity system. The vacuum wastewater system will be able to safely segregate contaminated fluids and send them for specialized pre-treatment, protecting area aquifers in a closed system.

Case Study

Additional Case Studies

> Bayer Pharmaceutical—Design for Cleanroom vacuum wastewater conveyance system in Berlin

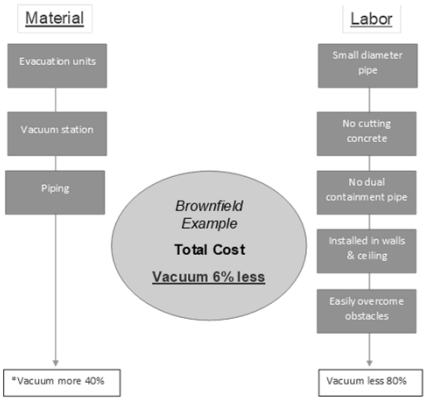
> Beta Gama Services– LLRW contaminated liquids for a food irradiation plant in Germany

> NECCO Revere, MA – Floor wand, drain and vacuum system customized by Airvac in candy factory

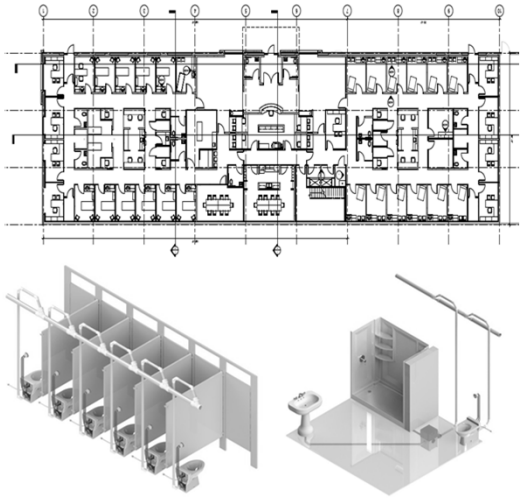
COMPONENTS

Vacuum Liquid Conveyance Systems

Vacuum vs. Gravity - Material vs. Labor Cost



*Vacuum station includes an additional 10% in pump redundancy



Vacuum Liquid Conveyance Systems

Sample Product and Componentry Details: Vacuum Station

Vacuum Pumps

> Maintains constant vacuum range (16-20” Hg) on tank & piping

Collection Tank

> Centrally collects liquid

> Multiple liquid streams can be collected via one vacuum station

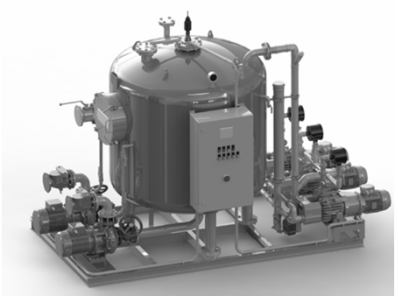
Discharge Pumps

> Discharges collected liquid for reuse, pretreatment &/or treatment

Misc.

> All pumps alternate lead/lag & redundancy

> Fabricated & pretested at factory & commissioned onsite



Vacuum Liquid Conveyance Systems

Sample Product and Componentry Details: Liquid Collection

AE25

> 20’ lift max

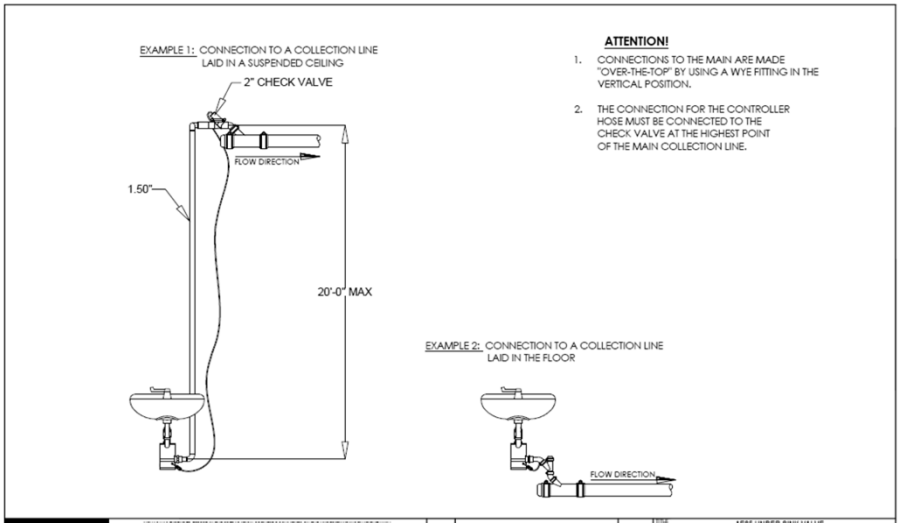
> 1 ½” pipe connection

> Liquid only

> Mounts under sink

> .06 gal / cycle

> 2 GPM

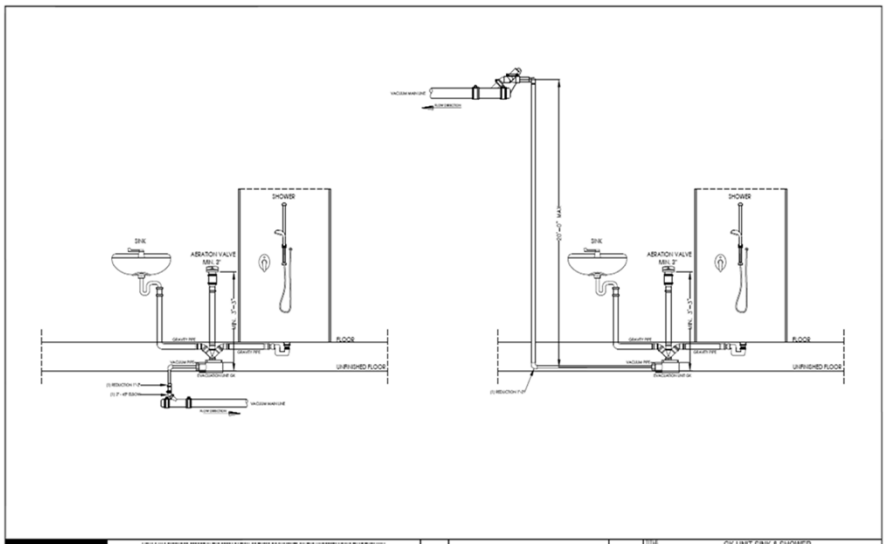


Vacuum Liquid Conveyance Systems

Sample Product and Componentry Details: Liquid Collection

GK Unit

> 20’ lift max
> 1” pipe connection
> Liquid only
> Stainless steel
> .26 gal /cycle
> 8 GPM

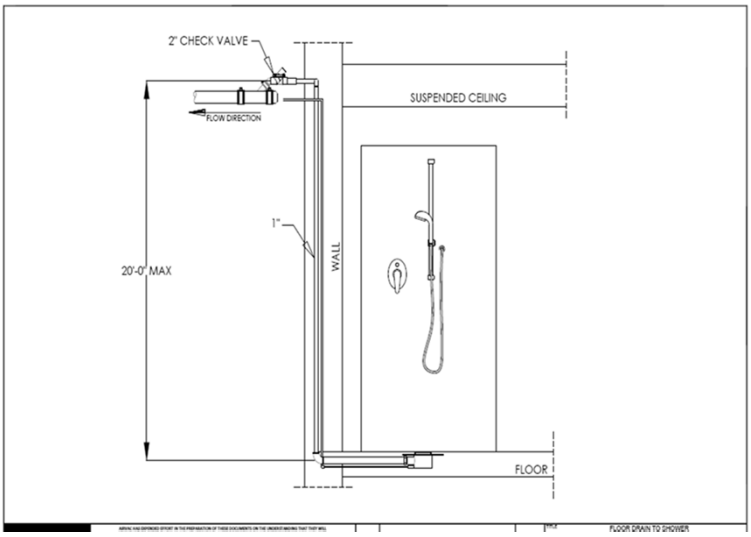


Vacuum Liquid Conveyance Systems

Sample Product and Componentry Details: Liquid Collection

Floor Drain

> 20’ lift max
> 1” pipe connect
> Liquid only
> Stainless steel
> .27 gal /cycle
> 8 GPM

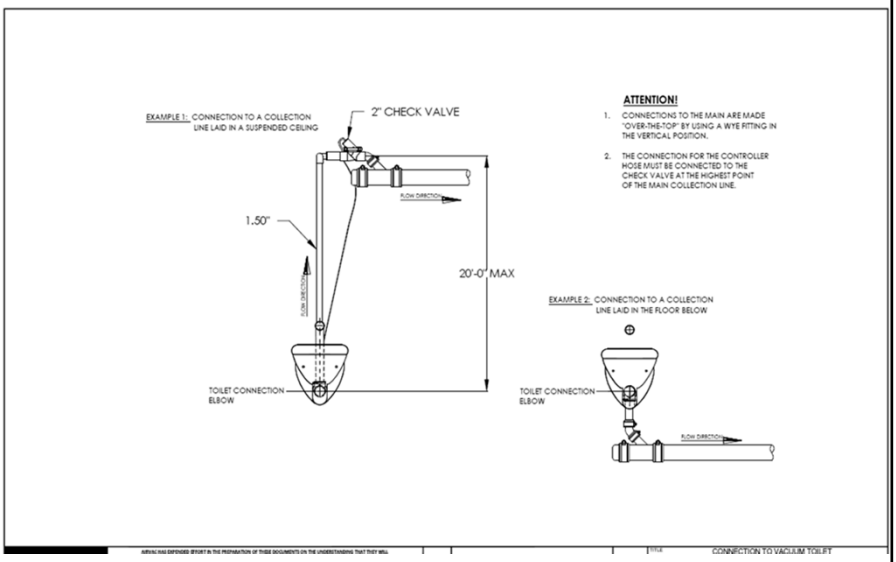


Vacuum Liquid Conveyance Systems

Sample Product and Componentry Details: Liquid/Solid Collection

Vacuum Toilets

- > 1 ½" connection
- > 78 dB
- > Vertically lift 20'+
- > Floor mount
- > Wall mount
- > Stainless steel



Vacuum Liquid Conveyance Systems

Sample Product and Componentry Details: Liquid/Solid Collection

Collection Sumps

- > Sizes ¾ to 50 gallons
- > Liquid & solids
- > Vertically lift up to 20'
- > PE, FG & SS
- > Pneumatic/no power requirements

Vacuum Liquid Conveyance Systems

Questionnaire

WHAT IS NEEDED	DESCRIPTION	WHY NEEDED?	INFORMATION PROVIDED
Map clearly showing the area to be served	This can be as detailed as an ACAD drawing or as simple as a scan of a map with the service area outlined with a sharpie	There are physical limitations to a vacuum system in terms of elevation differences, how far the system can be extended and how much flow can be handled by a single vacuum station.	Describe type of mapping provided
# of connections to be served	Please provide the total # of connections to be served. *Ideally, this should match the # shown on the map provided*	In addition to vacuum main & vacuum station component sizing, this information is needed to determine how many and what type of collection chambers are needed	Provide the total # connections
Flow rate Ave Daily Flow (ADF)	Please provide the average and peak flow rates expected at each connection	Vacuum main & vacuum station component sizing as well as the type of collection chambers are all a function of flow rate.	Provide the connection ADF (gpd/connection)
Lifting requirements	Please provide the required vertical lifting requirements	The flexibility of the vacuum system allows liquid to be vertically lifted 20'+ and the vacuum mains, laterals & collection chambers need to be sized per the requirements.	List vertical lifting requirements (typ. 0-20')
Expansion possibilities/phasing	Let us know if additional capacity for future growth or project phasing needs to be considered	Depending on the magnitude, this could affect the vacuum main and vacuum station size and how we approach the layout itself.	Describe expansion possibilities or phasing plans
Liquid type & temperature	Please provide the type and average temperature of the liquid to be collected	Depending on the liquid type and temperature, this could impact the type of equipment we propose.	List type of chemical & its temperature
Possible site(s) for a vacuum Station	Please indicate a location that may be a candidate for a vacuum station. *A centrally located area is ideal*	The # of vacuum mains required as well as their size is dependent on where the station is located	Indicate possible site(s) location or show on map

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