



**A.H. LUNDBERG SYSTEMS®**

## **Products & Services**



*Celebrating 70 Years  
of Global Engineering  
Excellence*



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**...The product is greater than the sum of its parts.**

## **Excellence: time-tested and proven.**

From modest beginnings in 1954, A.H. Lundberg Systems has evolved into a leading designer of environmental systems, energy optimization, chemical handling, and process engineering services to power, resource, and processing industries.

We are a Canadian company with corporate offices located in Vancouver, British Columbia, Canada. Through our Vancouver office and our agents and representatives, we provide solutions to industrial enterprises worldwide. Our commitment to these industries over the years and the experience of our staff give us the expertise that our clients have come to rely upon. Continuous involvement in limited areas permit us to offer specialized services utilizing the latest state-of-the-art technology.

Working with A.H. Lundberg Systems means working with a company that takes care of every aspect of a project. We understand how integrated systems can interact and how they may affect one another. Building upon years of experience, we continually provide new solutions to plant needs, expanding on what has been done before.

A.H. Lundberg Systems' capabilities do not stop with process knowledge. We have the resources to perform every element of an EPC project, tailoring our scope and project team to meet the specific needs of the client, looking carefully at every aspect to find the best fit and develop the most cost effective solution.

The ability to adjust our scope to meet project needs allows

our clients to efficiently utilize existing plant resources and expertise in conjunction with ours.

Our innovative ways include not only what we do, but also how we do it. Our knowledge gives us the flexibility to adjust the system design, or the implementation of the project, to provide the customized solution required.

The proper scoping of a project, the ability to tie multiple systems together that are diverse, yet interrelated, and building the proper project team are all ingredients assuring overall success. We are committed to the goal of providing a technically advanced, high quality, economical, safe and reliable installation.

Our goals are to meet your needs for technically advanced, high quality, cost effective, safe and reliable system design and engineering services. Our customers have come to understand and appreciate these goals and our commitment to the industries we serve. We have built and maintained relationships on integrity and trust.

With A.H. Lundberg Systems you will experience the same project success whether you need to implement a single system component or an EPC solution involving multiple system integration.

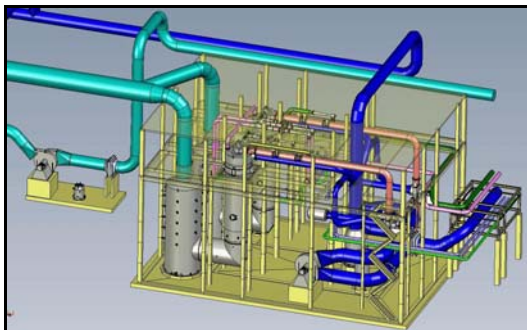
## Engineering Studies/Audits



A.H. Lundberg Systems is often requested to perform an audit on an existing plant system for a number of purposes including increasing system capacity, system safety, system efficiency, improve stability of ease of operation, trouble shooting and interfacing one system with another or future system. Each audit is tailored to the specific need of the client and may comprise a number of the areas listed above.

Our specialty is the process knowledge of the technology we provide. We utilize this technology to benefit a plant in the review of individual systems including all types of waste gas handling systems, condensate/sour water stripping systems, evaporator systems, and heat transfer systems.

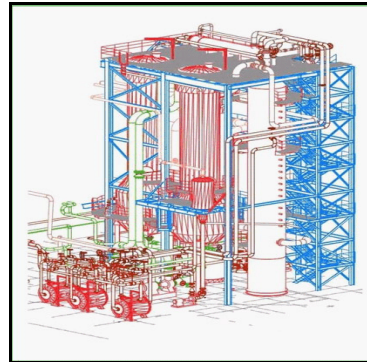
## Process Engineering



Process engineering provided by A.H. Lundberg Systems typically includes process flow diagrams, piping and instrument diagrams, customer vessel drawings, pump specifications, instrument specifications, typical general arrangements, assembly drawings (if appropriate) and operating and maintenance manuals. Drawings such as the piping and instrumentation diagrams and instrument specifications can be done on plant title blocks using standard symbolism and specifications.

Operating and maintenance manuals are individualized for the given process and plant requirements. Detailed information on all supplied equipment is included, in addition to a detailed description of all instrumentation.

## Project Engineering



A.H. Lundberg Systems can provide detailed engineering services for the installation of the project so that installation may be done by the plant using internal personnel or local contractors. A.H. Lundberg Systems has the capability to do the complete detailed engineering in house using our own engineers knowledgeable for the process to be installed.

The detailed engineering services that A.H. Lundberg Systems can provide include civil and structural design, mechanical design, electrical and instrumentation engineering, demolition detailing and piping design. We also can provide an erection advisor to oversee the process installation of the system.

## Full Project Turnkey



The project may be as small as the replacement or retube of a heat exchanger up to a complete multiple effect evaporator system. Every major system that we provide is suitable for installation on a turnkey basis.

A.H. Lundberg Systems will utilize existing plant specifications where applicable and where absent, we generate new specifications for plant approval. Further, the project will utilize plant preferred equipment and suppliers as well as utilizing local vendors that provide support to the plant.

A.H. Lundberg Systems has the capability to perform all of the major engineering disciplines in house including process engineering, mechanical design, structural design, electrical engineering and piping design.



**.... Safety. Reliability. Efficiency.**

## **Environmental Management Systems ....**

Whether there are new local regulations, stricter national requirements, or more demanding in house good neighbor policies, the end requirement is to safely and efficiently maintain your good environmental citizenship status.

Long after the project is complete, we continue to provide you with access to the latest safety and compliance technology. This commitment has made A.H. Lundberg Systems a leading designer of environmental systems for flue gas remediation, process waste gas handling, process condensate segregation, and foul condensate stripping.

Environmental compliance is a never ending challenge for industrial facilities throughout the world. Addressing these ever changing regulations is something at which A.H. Lundberg Systems excels.

We have been supplying safe and reliable solutions for decades. Our systems have exceeded all requirements at every location. The emphasis is to provide safe and reliable systems that are economically viable, allowing you to focus on making the overall plant operation profitable.



# AIR POLLUTION REMEDIATION

A.H. Lundberg has over 50 years of experience in remediation of process waste gas discharges. Installations range from complete plant-wide system integration of the air pollution equipment, system add-ons and retrofits, and the engineering and design of upgrades to meet progressively more stringent emissions requirements.

Waste gas pollutants we have addressed include air-borne particulate matter, acid mist, volatile organic hydrocarbons, inorganic gases, and combinations of these hazardous air pollutants.

## Waste Gas Conditioning & Transport



Our system design and supply capabilities include source collection, transport, gas conditioning, and destruction, or recovery of the pollutants.

Conveying of the gases may be done by using steam or gas motivated ejectors, fans, pressure blowers, or liquid ring pumps.

## Direct Thermal Oxidizers



Where thermal oxidation of the pollutant is the desired control technology, our incinerators are provided to meet every regulatory requirement for destruction of volatile organic hydrocarbons (VOC), CO, SO<sub>2</sub>, NO<sub>x</sub> and particulate emissions.

## Regenerative & Catalytic Thermal Oxidizers



Although thermal oxidation is recognized as the best solution to destroy VOCs, the challenge is to minimize fuel and operating costs of the process.

The AHL Thermal Oxidizers provide a destruction efficiency of 98 to 99% of the VOCs at a thermal efficiency of up to 95%.

Both standard and catalytic regenerative units have been applied with excellent success to a wide variety of industrial process such as wood dryer exhaust, printing, chemical processing, tire cord manufacturing, coating processes, and insulation manufacturing.

## Wet Electrostatic Precipitator



Our wet electrostatic precipitator provides a state-of-the-art solution to the highest possible efficiency in the collection of sub-micron particulate, fumes, condensible organic aerosols, and acid mist.

## Wet Scrubbers

A.H. Lundberg designs and supplies venturi scrubbers to remove particulate mater from air streams, packed tower scrubbers to absorb a gaseous component of the air stream, and spray tower scrubbers to achieve absorption of a gaseous component of the air stream where particulate or fouling are also of concern. Each scrubber is designed to meet the requirements of the specific application, and to meet regulatory guidelines.



Water remediation requirements can include clarification and/or filtration of suspended solids, pH neutralization of acidic or alkali waste streams, demineralization, and removal of hazardous organic contamination.

The requirements range from disposal allowance to reuse as plant process water to recovery of valuable products in the contaminated stream.

A.H. Lundberg offers process engineering, system design and supply, and plant integration of several technologies to meet these needs.

## Strainers and Filters



Strainers and filters are used to remove suspended contaminants from an aqueous, organic or gaseous stream in order to produce a higher purity product.

Vessel geometry can be as simple as a single vessel or be arranged as a multiple vessel system with automatic switch-over and backwash. Continuous and intermittent automatic backwash arrangements are also available.

## Decanting



The decanter and storage tank is used where it is necessary to remove an immiscible lower density fluid from another higher density fluid. The decanter is sized to provide sufficient residence time for the immiscible fluid to separate, then be skimmed off and stored.

## Steam Stripping



An effective method of treating process foul condensates (sour water) contaminated with hazardous hydrocarbons, sulfides, ammonia, methanol, and TRS is the distillation of the waste water stream through steam stripping.

The resulting stripped condensate may be reused in the plant as process water and the contaminant may be recovered and purified for separate utilization.

## Evaporation



Purification of waste water streams through evaporation can provide industrial facilities the opportunity to recapture and reuse nearly all liquid waste streams.

Full demineralization of the waste water and zero liquid discharge is available through the additional step of evaporative crystallization. The dissolved contamination may be extracted as a solid filter cake, providing the plant with the opportunity to dispose of solid waste salts only. Additional equipment requirements includes filtration systems and salt drying systems.



**. . . . Recover. Utilize. Optimize.**

## **Energy Recovery and Reuse . . . .**

The price of energy has always been a major component in a plant's cost structure. Therefore, to optimize the process designs to minimize the impact of energy use is crucial to the profitability of an enterprise.

Our knowledge and experience with interconnected plant wide systems, blended with the proper amount of creativity, help us improve the profitability of your facility. All aspects are considered in this process, including operability, capital costs, operating costs, maintenance and safety.

Our expertise includes the efficient implementation of heat recovery steam generators, direct contact condensers and waste gas heat recovery systems.

We implement direct contact and indirect contact heat recovery systems to extract energy and where possible recover valuable chemical products or hazardous contaminants.

We evaluate each potential solution to determine the best fit for your facility. We work with high or low grade heat recovery. If an installation cannot use the low grade heat in its present form, we look to upgrade it to a higher level of energy or utilize it in an innovative way.

From audits that identify procedural changes in the plant's operation to major process and equipment modifications, our team of experienced engineers can help you to optimize your plant's energy use.

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A.H. Lundberg Systems designs and supplies specialty shell&tube heat exchangers, direct contact condensers, surface condensers, hot gas quenchers, waste gas heaters and coolers, and vent gas heat recovery systems.

In many cases this requires working with contaminated low pressure steam, gases and liquids that may be toxic, corrosive, and severely fouling.

Knowledge of, and the capability to deal with, contaminants is integral to successfully recovering the energy in process streams. Keeping equipment costs down is essential, especially when the metallurgy is exotic.

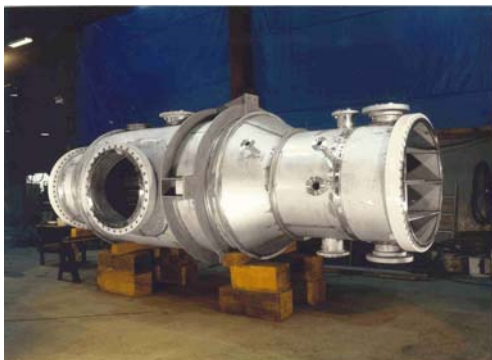
## Shell & Tube Heat Exchangers



Our expertise in shell & tube heat exchangers includes heavy liquor heaters, digester recirculating liquor heaters, and chlorine dioxide solution heaters for the kraft pulp industry. Our installations include systems to recover organic aerosols and free water from industrial waste gases and conditioning systems to safely destroy hazardous waste gases.

Lessons learned in one industry have provided suitable solutions for other industries.

## Surface Condensers



A.H. Lundberg supplies surface condensers for many different types of gases and operating conditions. Horizontal and vertical orientation designs are given consideration. Condensers may be designed on a “stand alone” basis or be interated into a mass transfer column.

Our experience includes the design and supply of dirty steam condensers, foul condensate condensers, reflux condensers, organic vapour condensers, and condensers containing high percentages of non-condensable gases.

## Direct Contact Condensers



A.H. Lundberg Systems provides direct contact condensers for services such as batch blow heat recovery, autoclave flash steam heat recovery, boiler exhaust gas heat recovery, process waste gas vent condensing/vapour recovery, and atmospheric refiner blow heat recovery.

Service requirements include dealing with debris fouling, corrosives, and high loading of non-condensable gas components.

Energy recovery is generally dedicated to heating plant water or plant process liquid streams. A.H. Lundberg Systems has the experience to present optimum solutions for each application.

## Hot Gas Quenchers



Excessive heat entrained in gas streams can be effectively removed by direct injection of water or other liquids into the gas stream, utilizing evaporative cooling. Our quench vessels are designed to introduce fine aerosol sprays at critical positions on the vessel to achieve the most efficient absorption of the liquid without carry-over.

We offer refractory lined, brick lined, high nickel alloy, and reactive metal construction as required by the process. Horizontal and vertical arrangements are available.



Maximizing every effect

.... Economize. Improve. Modernize.

## Evaporation Technologies . . . .

As a leading manufacturer of evaporation and distillation systems worldwide, A.H. Lundberg Systems is well qualified to provide modifications to existing evaporator systems.

Some of the more common reasons for modifying existing evaporator systems include capacity increase, economy increase, increase in run time between cleaning, reduction in liquor carry over with the vapor, mechanical rebuild and condensate segregation.

Reduction of fouling in the evaporator set is also a common issue. We offer technologies such as product effect changes and flow augmentation to reduce scaling tendencies.

We are experts in the mechanical rebuild or replacement of existing effects on an EPC basis. This includes the replacement of vapour heads, retubing of effects, removal and installation of new heater shells and replacement of bodies.

Quite often in the complete replacement of existing bodies, new features may be incorporated which result in improved condensate segregation and increased capacity.

We offer the retrofit of our high efficiency mist elimination system to existing evaporators to reduce liquor carry-over in the vapour exhaust, allowing an incremental capacity increase to the evaporation system.



Evaporator technology varies from tubes to plates, inside versus outside, and up, down or flooded. Systems may have a single effect or multiple effects. Most requirements involve the efficient use of heat from steam to evaporate water from a process liquid to either recover chemical or purify the water or both.

For applications ranging from black liquor evaporators for the pulp and paper industry, sugar refining, alcohol, and Produced Water from the oil & gas industries, A.H. Lundberg Systems offers the knowledge and experience to be able to choose the best technology for each application.

## Evaporators & Concentrators



We build evaporators and concentrators in steel, austenitic and duplex stainless steels, high nickel alloys, and reactive metals.

Our installations include multiple effect systems in rising film (LTV), falling film, and hybrids of the two technologies tailored to meet the individual requirements of each customer.

## Pre-Evaporators



Pre-evaporation systems utilize low-level waste heat (where available) to evaporate weak liquor prior to the main evaporator train. Aside from using waste heat, one of the main advantages of a pre-evaporation system is condensate segregation. The ideal scenario for a mill with a pre-evaporation system is to use separate liquor storage tanks for the virgin weak liquor and liquor that has been through the pre-evaporator.

The pre-evaporator strips the bulk of the TRS and VOC's from the liquor resulting in an evaporator system condensate that is substantially cleaner.

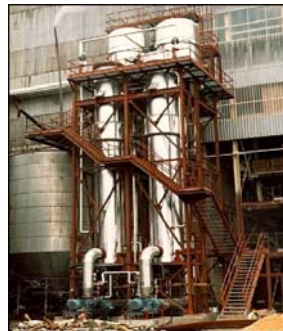
## Concentrators with MVRs



Where low pressure steam is not available, A.H. Lundberg Systems offers single effect falling film concentrators with mechanical vapour re-compression to power the evaporation process. Although “starting steam” is required to start the evaporation process, re-compression and re-use of the steam/vapour produced from the liquor itself, is used as the heat source to maintain the evaporation process.

All A.H. Lundberg Systems concentrators with mechanical vapour re-compression have high efficiency mist eliminators in each vapour body, assuring high purity condensate is achieved from the condensed steam and valuable or destructive salts are not carried over in the vapour phase. Where necessary, for highly foaming liquids, external vapour washers are available, integrated into the vapour re-compression system.

## Crystallizers



A.H. Lundberg Systems' preferred technology for crystallizing solids from liquor or brines is “Flooded Forced Circulation”. This technology utilizes forced liquor circulation through the tube side of a heater with the liquor under a back pressure to suppress boiling. The superheated liquor is flashed in a vapour head, resulting in evaporative cooling.

The heater body is a separate vessel from the vapour head and may be mounted vertically or horizontally, as space permits.

High efficiency vertical chevron type mist eliminators are used in the vapour heads to assure high purity condensate is recovered and chemical concentration is maximized to the liquor.



We provide systems to handle, off load, and store most chemicals used in process industries, including sulphuric acid, sodium chlorate, chlorine, sodium hydroxide and molten sulphur.

Custom Equipment designed by A.H. Lundberg Systems can range from specialized pressure vessels, distillation columns, hot gas quenchers, and specialized mixer/reactors. These systems are custom designed for purpose and include:

## Chemical Handling Systems and Reactors

- White Liquor Oxidation
- Sulphur Burners
- Stirred Surface Reactors
- Distillation Columns
- Vaporizers
- Chemical Handling Systems
- Quench Vessels

## Separation Technologies

- Cyclones
- Liquid Decanters
- Chemical Filters and Strainers
- Mist Eliminators
- Venturi Scrubbers
- Multi-stage Flash Tanks

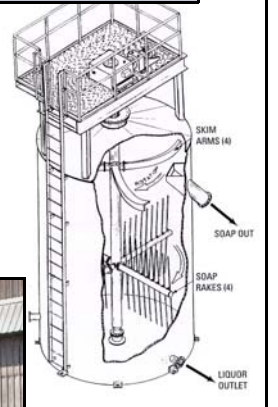
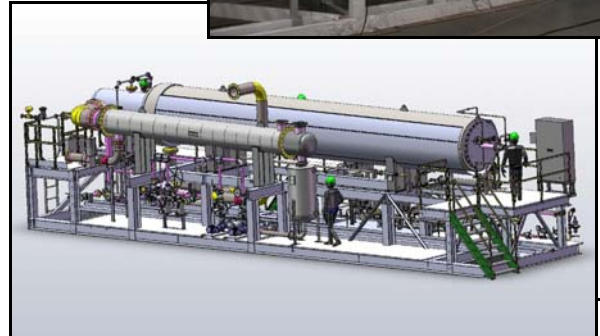
## By-Product Recovery

- Methanol Recovery
- Turpentine Recovery Systems
- Soap Handling and Recovery
- Skimmers and Launderers
- Foam Breakers
- Black Liquor Soap to Biodiesel Conversion

**System Components** support all our technologies as critical safety devices such as:

- Flame Arresters
- Overflow Seals
- Excess Flow Valves
- Explosion Hatches
- Pressure and/or Vacuum Relief Valves
- Site Glasses
- Vent Dryers
- Soap Layer Interface Detection System

System components may be used to upgrade or expand existing systems. We offer a full range of engineering services to evaluate and redesign existing systems, as necessary to meet the most current plant standards of our customers.





## Canada:

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## WORLDWIDE REPRESENTATIVE NETWORK

The following is a list of the A. H. Lundberg's worldwide network of representatives. Your local representative will be pleased to provide further information about our products and services

