

WINERY INNOVATION



EHL GROUP in collaboration with FABRUM SOLUTIONS

EHL GROUP

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Overview:

The uniqueness, individuality, and ongoing drive for quality of wine production requires encountering multiple variables in how and where any part of the overall process takes place. Most producers undertake the core stages of the wine making process at a single site or within a single geographical region. Whilst some of the larger producers begin the process at regional sites, they, as well as some contract bottling operators, have centralised the final processing and packaging of the product.

The versatile solution EHL Group in collaboration with our technology partner Fabrum Solutions present has been greatly influenced in its development by the key individuality requirements of the wine making process to achieve unique outcomes and downward effects on cost and security of supply with the often remote or regionalised nature of the industry.

Our premise was an overall drive to reduce risk of supply interruption and bring key nitrogen supply provision within the individual facilities. The ability to produce localised liquid and gaseous nitrogen brings control back within the sites control. Designed to meet the purity requirements of the process, again this can vary by producers / wine makers process parameters, the individualised systems combine the ability to supply either or both liquid and gaseous nitrogen generated onsite with an additional ability to supply high quality compressed air (ISO8573-1:2010 Class 1.2.1) to the critical pneumatics again substantially reducing risk.

These new systems are capable of also producing liquid and gaseous nitrogen, oxygen and air to varying purities for unique applications. The EHL / Fabrum combination of localised production system capabilities render cost effective, low supply risk, and utility control for blanketing, sparging, bottle rinsing, purging, capper topping (drip), etc combined with optional onsite cylinder filling to allow for delivery in facilities where a centralised distribution network is not available. Negate the external reliance on supply, negate the number of deliveries, transport costs, and supply risks, coupled with reduction in the greenhouse gas emissions caused by delivery trucks and consistency in the supply parameters of this high-volume utility in wine production.



Background:

EHL Group is a highly experienced team of engineers, electricians, designers, technicians and support staff dedicated to ensuring the solution provided meets the needs of the application. EHL can provide the design, manufacture, installation, servicing, calibration, and project management, of engineered solutions for a wide variety applications and industries having successfully undertaken and completed many projects across Australia, New Zealand and further afield.

With a keen interest in the development and proto-typing of ideas and innovations across a wide range of industry sectors, EHL Group provide a consultative project and system solution design and production process from conception to realization.

EHL's globally experienced team includes mechanical design engineers, hydraulic engineers, tube & piping fitters, industrial electricians, fitters, industrial designers, welders, trade assistants, workshop technicians, product specialists, sales and marketing staff, accounts and support personnel, project coordinator, and qualified hose doctors.

EHL specialists have created solutions for food and beverage customers across Australia, New Zealand, India, UK, and USA leveraging global relationships with key component suppliers to design, build, install, and support specific equipment to meet the application and sites requirements.

Fabrum Solutions are cutting edge leaders in the field of cryo-cooling. New Zealand innovation combined with global engineering success has allowed Fabrum to become recognised as engineering innovators. Fabrum Solutions is a team of highly specialised mechanical and electrical engineers, designers and technicians. Fabrum research, design and develop new technology and processes in the construction, jointing detail and manufacture of high tolerance, niche market components and systems. Fabrum conduct every facet of design, development and manufacturing in their purpose-built facility in Christchurch, New Zealand. Fabrum's key objective is to lead the world in the design, development and build of advanced industrial composite solutions, system assemblies and cryogenic products. Currently, we produce composite equipment for the cryogenic and superconducting industries, including cryocoolers. Fabrum's facility and large-scale metal procurement also provides integrated manufacturing for complete systems assembly. Fabrum Solutions have formed a global joint venture with Absolut Systems, called AFCryo. Utilising Absolut's world leading cryocooler and cryogenic cooling system design capabilities, this joint venture (AFCryo) can deliver global cryogenic solutions across a wide range of industries including wine, LNG, aviation and space, human medical and animal husbandry, and transportation and superconducting.

The Australian and New Zealand wine industry has been a key focus with the identification of solutions in utilities such as compressed air and nitrogen gas supply, liquid nitrogen self-generation for droppers, and filtration to assist clients in cost reductions, increased supply security, quality adherence, and reliable support.

Combining technologies to offer a single source Nitrogen and Air solution was a logical progression for clients in the food and beverage market to ensure the ongoing supply of key utilities which are used year-round across a multiple of applications within the production process. These solutions enable clients to keep to production plans, vary quantity requirements to meet demand, have confidence in the international compliant quality and quantity of gasses, all by bringing the supply solution 'in-house' and reducing risk and cost for the business.

EHL Group comprises three core hubs with the main site consisting of key manufacturing, design, testing, sales, admin and support centred within the industrial hub of Bell Block, New Plymouth (NZ), a second EHL maintenance, sales and support facility in based in East Tamaki, Auckland (NZ), and Melbourne (Australia) is the base of EHL Groups Australian operations providing technical sales, service and support for field operational teams.



Solution:

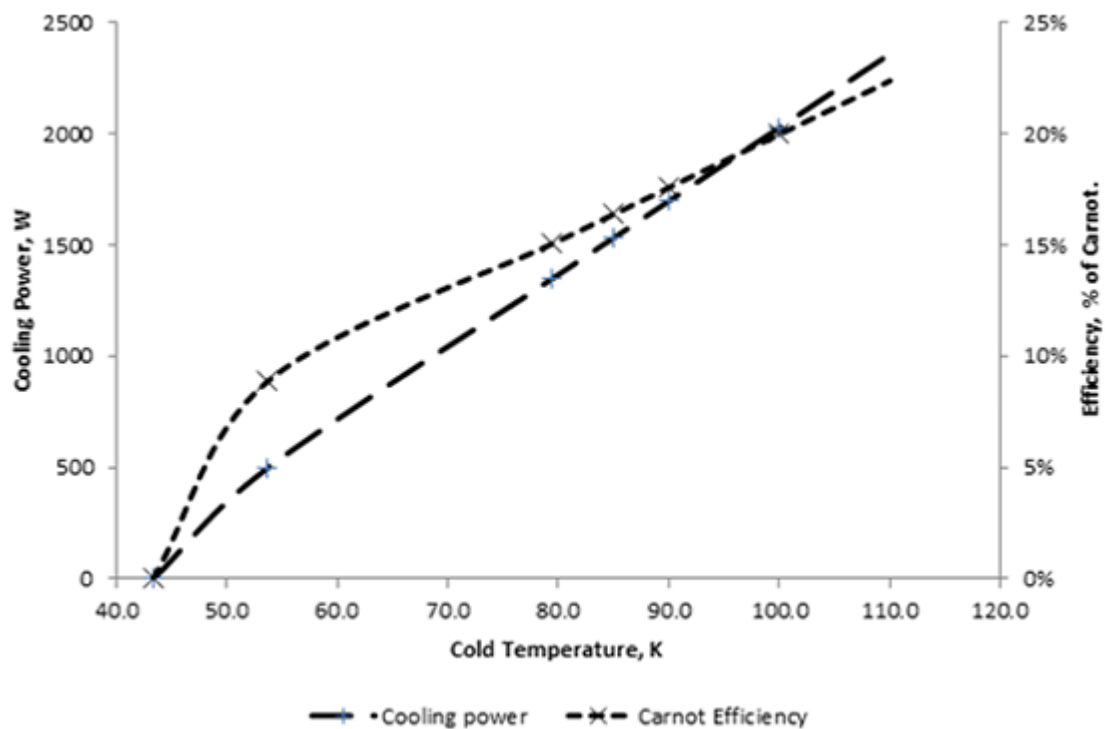
The flexibility in design allows either or all three solutions to be integrated into one footprint all designed and specified to meet the individualised requirement of a site.

Available solutions:

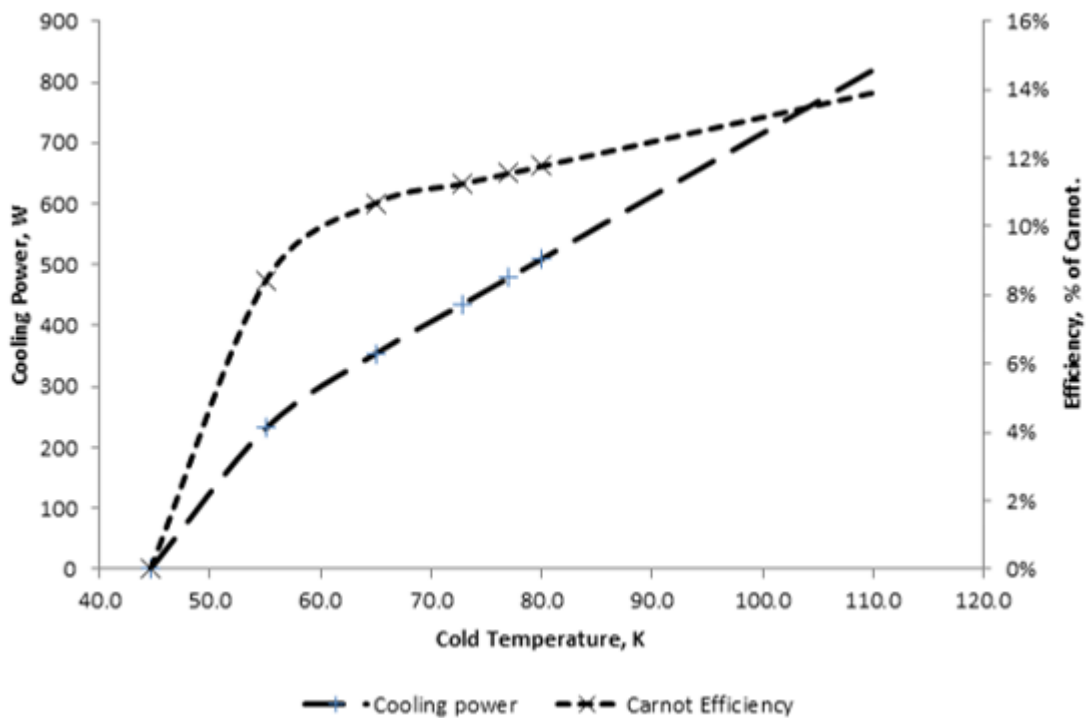
- **Treated Compressed Air** – to ISO8573-1:2010 standards (Class 1.4.1 – General Plant Air or Class 1.2.1 – Instrument or Food Grade Air approved for air in contact with product or containers for product) Note: this air is also recommended for use in critical pneumatic applications to minimise contaminants and dramatically increase uptime and lifespan of valves etc. Moisture egress is reduced with General Plant Air to a Pressure Dew Point (PDP) of ~+3°C and Food / Instrument air at a PDP of -40°C (Note: a PDP of ≤ -26°C completely inhibits any organic growth in the pipework and hence will not introduce biologics into the stream)
- **Gaseous Nitrogen** – to EIGA, BCAS, FDA, and BRC standards for food and beverage. Industry standards require nitrogen flows to be ≥ 99.5% purity. Gaseous flows to required pressures with an additional option of the capability to fill high pressure cylinders on site to allow the self-reliance on these portable supplies should the site not have reticulated lines.
- **Liquid Nitrogen** – generated by cryocoolers that utilise patented diaphragm pressure wave generator technology (DPWG) and linear pulse tubes for condensing and liquefying cryogenic gases. This technology was designed and developed in NZ by a key EHL partner and incorporates cryocoolers utilising a standard electric motor and a simple drive mechanism to ensure service intervals of 50,000 hours between major overhauls. Cryocoolers are 470 watts and 1250 watts cooling output at 77K. These units utilise a high-efficiency linear pulse tube technology. The core technology is the pressure wave generator, which hermetically separates the working space from the pulse tube gas space, ensuring long operating periods between major services, and allows easy access for preventative maintenance without disturbing the clean gas circuit. These units are built in NZ and all IP is retained locally within ANZ.



EHL and Fabrum now has the PTC330 and PTC1000 cryocoolers available for commercial use. The first cryocooler, denoted the PTC330, is a single in-line pulse tube running on a 330 cc swept volume DPWG that produces 480 W of cooling at 77 K. The second cryocooler, denoted the PTC1000, combines three in-line pulse tubes on a single 1000 cc DPWG and is capable of 1250 W of refrigeration at 77 K with a Carnot efficiency of 15%. The pulse tube's lack of moving parts combined with the DPWG's ruggedness and mechanical simplicity have resulted in a cryocooler that is ideally suited to liquefaction of gases in industrial environment. The units utilise a standard electric motor and a simple drive mechanism to ensure service intervals of 50,000 hours between major overhauls



Cooling power of the PTC1000 cryocooler at 47 Hz running speed.

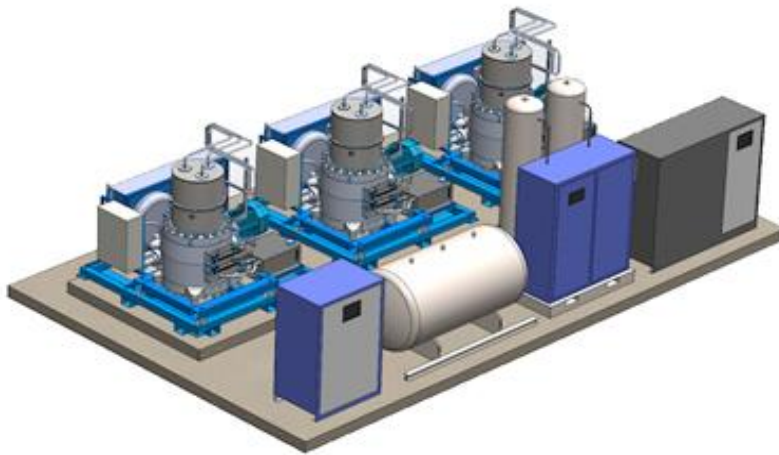


Cooling power and Carnot efficiency for the PTC330 cryocooler.

Key Technology Advantages:

- ✓ The long-life diaphragm that separates the cryogenic cold head from a pressure wave generator: ensures a clean cryogenic system with zero performance degradation during its operating life.
- ✓ By using off-the-shelf drive mechanisms and components: motors, seals, bearings and controls are easy to source and replace, ensuring minimal downtime in any service period.
- ✓ Long life pulse tube: no moving or wearing parts. The linear Pulse Tube allows a gravity feed of liquid back to the dewar.
- ✓ Minimal set-up requirements: plug in for liquid production in 20 minutes
- ✓ Scalability: connect multiple units for greater production.
- ✓ Annual servicing is simple and performed onsite: 50,000 hour servicing is done on location with supplied tools and training.

- These solution permutations can be then skid mounted or containerised to suit the site requirements. Site conditions have a marked effect on all efficiencies within compressed air and nitrogen systems and must be taken into account during system design stage of any project.
 - Ambient temperature range
 - Altitude
 - Relative Humidity range
 - Potential impact of proposed deployment position on site



Proposed Large liquification Solution

Cryocooler Development Timeline



EHL and Fabrum bring the expertise in combining and optimising all these technologies together to offer this industry leading solution. Understanding the engineering behind and contained within the technology coupled with an appreciation of the industry standards and application demands, allows EHL and Fabrum to bring this leap in capabilities to market.



Industry Impact:

As detailed in the previous sections the prime drivers in the development of this product are security of supply and overall cost reduction for the site or process. The systems in any form have applications across a broad range of industries in addition to the Food and Beverage market which have seen units deployed with Research facilities, Pharmaceutical production plants, Universities, and even with NASA in the USA.

All manufacturers and producers need security in their utility supply as an interruption can lead to production pauses and stoppages or even product / sample spoilage. EHL and their key design partners understand this, and reliability underpins design rationale.



Positive IMPACT for Industry

- ✓ Inhouse supply of utilities – Client is in control
- ✓ No reliance on third parties for deliveries
- ✓ Continuity of supply – **No running out**
- ✓ No gas wastage through boiloff
- ✓ **COST of utility REDUCTION**
- ✓ Reduction in greenhouse gas emissions through no ongoing truck deliveries –
POSITIVE for the ENVIRONMENT
- ✓ Reduction in administration costs through negating order raising / processing
 - ✓ Reduction in safety concerns with NO high-pressure storage vessels
 - ✓ Reduce consumable costs turning outgoings into asset creation

EHL Group believe this innovative technology and subsequent diverse application bases across variable markets using differing combinations of feed gas solutions brings to industry a unique single source answer to the secured supply of a key utility ingredient of production no matter where deployment may be required.

EHL Group

VISION

Empowering our people, growing our skills, exceeding expectations, and embracing safety and environmental awareness, will enable EHL Group to be the premier design, supply and integration engineered systems solutions provider for Asia Pacific

MISSION

To provide engineered solutions to a wide variety of markets and business segments throughout New Zealand, Australia, & South Pacific, supply and support turnkey systems and components ensuring we meet the complex & exacting safety, environmental, performance, & cost-efficient standards demanded by industry.

VALUES

Alignment and accountability: We accept responsibility for our actions. We make and support business decisions through experience and good judgment.

Customer Service Excellence: We are dedicated to satisfying customer needs and honoring commitments that we have made to them.

Teamwork: Our team is supportive of each other's efforts, loyal to one another, and LOOK OUT for each other both personally and professionally.

Balance: We are flexible, helping team members strike a healthy work and life balance.

Community and environment: We ENDEVOUR to help and improve the communities where we work and live. We RESPECT the environment and promote the use of recyclable products and renewable energy.

Integrity: We act with honesty and integrity, not compromising the truth.

Passion for results: We show pride, enthusiasm and dedication in everything that we do. We are committed to selling and delivering high quality products and services.

Respect: We treat our team members, customers, partners and suppliers with mutual respect and sensitivity, recognizing the importance of diversity. We respect all individuals and value their contributions.

Open Communication: All team members are encouraged to openly share their opinions and views

CULTURE

We are one team that is encouraging and supportive. We are committed to the success of our clients.

We pursue excellence through continuous improvement and effective, efficient execution.

We are accountable for decisions we make. We are responsive and collaborate to achieve the best result.

We communicate honestly creating an open, transparent and trust-based environment.

We inspire creativity and innovation with passion and energy. We respect and appreciate the perspectives of others.

We care about the growth and development of our people, our clients and our community.

We all lead by example, every day.



Fabrum Solutions Limited

Our Business Activity and Purpose is twofold:

Cryogenic Systems – AFCRYO:

- Cryocoolers and Liquifier Solutions
- Insulated Containment Systems (composite cryostats and dewar systems)

Fabrum Solutions Development and Manufacturing

- Theoretical and practical engineering precision and capability in medical, mineral, space, aviation, transportation and superconducting.

AFCRYO Vision: *Our products are critical elements in the end use liquefaction and containment of atmospheric gases and LNG.*

Fabrum Solutions Vision: *Growing with key clients as their design and manufacturing IP partners. Our combined knowledge, innovation and performance will secure their and our success.*

Mission: *Our highly skilled workforce delivers world-leading solutions to our clients leveraging our knowledge across the industries we work in to deliver highly desirable products. We work as a smart team utilizing our wide variety of knowledge and clever ideas.*

Values:

Who we are – Own clever. Live innovation. Be adaptive.

Be great. Live fiercely Own quality.

Live Christchurch. Own global.

Be honest and respectful.

As a team, export clever.

How we Play – Be bold. Fail fast. Adapt. Improve.

Our Principles: *All stakeholders are treated with respect; all new activity must support the business mission and vision; nothing starts until scoped, delegated, reviewed; we rehearse every market contact; we only invest in qualified long-term ROI, we recognize that design input has value and must be negotiated, not gifted; all projects will have a sponsor who takes responsibility for transparency and success; we will manage with fact and data; we will hold ourselves to account; no job is complete until an invoice is raised and payment received and the client is satisfied; and, it is OK to learn from mistakes.*

Purpose: *a local high-tech manufacturing business that excels internationally and improves people's lives. That business is based on R&D, manufacturing, and expert international business development, of cryocoolers and composite cryogenics. As a result there is the long-term evolution of an internationally respected design engineering centre-of-excellence and an advanced pilot manufacturing engineering centre in New Zealand.*

Fabrum Solutions is ISO9001:2015 accredited in the design, manufacture, testing and assembly of cryogenic solutions and products.





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