



**CLEARWATER
POWER TECHNOLOGY
LIMITED**

COMPANY INTRODUCTION



The CLEARWATER TECHNOLOGY GROUP

The original company that was to form the foundation of the Clearwater Technology Group - CTG - was founded in 1997 to offer engineering consulting services to the global pulp and paper industry. The group has diversified since its inception and has developed innovative and unique technologies which exhibit major future growth potential. The success of the group has been based upon a combination of novel and innovative technology, highly experienced personnel, a network of excellent industry contacts, partners and customers worldwide, and a desire to combine our success with that of our customers.

CTG comprises; Clearwater Consulting Partners (CCP); Clearwater Power Technology Ltd (CPT); and Provaris Ltd.

Clearwater Consulting Partners (CCP) has developed via the route of offering purpose designed process, machinery and project delivery to the global pulp & paper industry (all paper machines are unique – so bespoke design capability is highly valued). The company has a successful track record, highly experienced personnel, and an excellent industry reputation.

Clearwater Power Technology (CPT) was formed in direct response to accelerating customer demand for innovative and cost-effective solutions to the provision of energy to industrial users, particularly with respect to renewable energy sources such as biomass, hydro, wind, bio-fuels, refuse-derived fuels and high-rate biomass feedstock production. The latter through CPT's subsidiary - Global Cellulose Systems – through which we offer access to mass production micro-propagation plant growing techniques for the establishment of high yield crops on an agro-industrial scale.

Provaris, provides a vehicle for one-off and unorthodox developments outside of the normal scope of CCP and CPT. The company also specialises in the delivery of major capital projects suitable for inclusion in the offset investment programmes of major defence contractors such as BAE Systems and Agusta-Westland Helicopters.

The fit of each of the group companies is excellent. Each company has developed flexible, cost-effective operating structures and are therefore very competitive when measured by value delivered. In critical areas, the group offers our customers a major competitive advantage by our ability to deploy unique in-house process, manufacturing and financial modelling technology which is highly (and increasingly) valued by its customers – new and existing.

www.clearwatergroup.org



CLEARWATER POWER TECHNOLOGY LTD

Introduction

Clearwater Power Technology evolved from the growing demand from Clearwater Technology Group's customers for engineered solutions to a variety of energy and power generation related issues.

Initially, the focus was on process energy optimisation and cost reduction. This was followed by the adaptation of existing biological sulphate reduction technology used in the paper industry into a variant suitable for flue gas desulphurisation – particularly for high sulphur fuels where the lack of availability of cost-effective land fill capacity close to the generator means that conventional limestone or quicklime injection systems are not viable.

Clearwater Power Technology Limited "CPT" was formed in order to satisfy customer demand for the provision of innovative solutions for dedicated power and steam generation solutions (often utilising biomass / wood yard materials as part of the fuel source) and related technologies (eg. material handling and flue gas desulphurisation).



CPT has experience of implementing bio-gas (landfill and industrial) CHP facilities (typically up to 1 MW), through medium scale biomass and refuse derived fuel (RDF) co-generation schemes (20 MW), through to gas and oil fired "conventional" GT-based co-generation systems up to 120 MW and pet-coke gasification co-generations systems of up to 180 MW.

In addition to combustion, gasification, and generation know-how CPT has in-depth knowledge of the requirements and challenges of large-scale biomass propagation for power generation, and all aspects of raw and waste water treatment. Such knowledge includes the technology to mass-produce millions of high yield plants which cannot be propagated from seed (for example, *Arundo Donax*)



CAPABILITY

Clearwater Power Technology's capabilities are extensive and diverse, yet they share a common purpose: to provide engineering and scientific solutions for the energy, environmental and infrastructure challenges that our commercial, industrial and government clients face. Our services are grouped into the following areas:

- ✓ Feasibility Studies & Business Plans
- ✓ Process engineering and design
- ✓ Environmental Assessment and Regulatory Compliance
- ✓ Compact process and boiler feed water treatment systems
- ✓ Gaseous Emissions Abatement
- ✓ Waste Minimisation and Treatment
- ✓ Solid Waste Management
- ✓ Water, Wastewater and Water Resource Management
- ✓ Industrial Health & Safety
- ✓ Electrical and Mechanical Engineering
- ✓ Instrumentation Control and Automation
- ✓ Construction-Related Services
- ✓ Flue gas desulphurisation
- ✓ Biomass & bio-fuel crop development

CPT, in conjunction with our partners, has offered many of these services to industry throughout our history. Dedication to finding the most cost-effective solutions to our clients' individual needs, leading edge technology and an understanding of continually changing regulatory requirements have contributed to a growing list of satisfied, repeat customers.

Experience garnered through these long-term relationships has allowed us to refine our service areas into specific expertise pertinent to the process and environmental concerns of a wide range of businesses.

In addition, we access the resources of all of our offices to provide total capabilities → in consulting, process engineering, construction, environmental remediation and on-site industrial services → focused to address any challenge from start to finish, or at any point along the way.



PROCESS

CPT designs processes that combine the client's knowledge with our skills and experience. We recognise that the key to a successful manufacturing business is a production line efficiency that delivers quality products with uniform consistency. This can be delivered with the use of process simulation products that have been developed by Clearwater. ("CLEAR-SIM"™ and "VR-SIM"™)

FUNCTIONAL PLANNING AND PLANT LAYOUT

CPT uses Value Management and Value Engineering methodologies to deliver efficient and robust process design. Typically full consideration is given to the design of employee facilities and material flow within the plant. The building footprint is minimised through careful design.

Clearwater offers flexible service delivery options to enable clients to address short-term and long-term objectives as well as providing assistance where project funding is a requirement.

CLEARWATER IN THE ENERGY INDUSTRIES

CPT has a keen understanding of the needs and requirements of the energy industry. By working closely with the Client's own project team we aim to understand the exact and specific requirements and goals of every project.

CPT specialises in this sector. Virtually all the CPT team has direct experience of working in the industry – i.e. at the sharp end of management, operations, engineering and technical.

Our partners have major resources and breadth of experience, coupled with in-depth experience of the power generation and related sectors.

Thus, CPT offers an unrivalled combination of powerful resources, experience and leading edge technology and innovation. There are no elements of any process related project of any scale that CPT cannot deliver.

SPECIALIST PROCESS SERVICES

Process design and simulation using: " CLEAR-SIM "™

Our expertise and the use of our unique dynamic process modelling and simulation techniques (CLEAR-SIM) enables us to achieve exacting levels of accuracy in all aspects of process design, from initial conceptual development



through to final process equipment specification and verification prior to procurement.

This includes emulation of virtually all common process variables (mass, flow, consistency, temperature, ash, fines, pressure, level, pressure drop, dissolved solids, enthalpy, variable cost contribution) for every individual process stream, for every conceivable operating scenario.

A powerful and high-fidelity financial module is available as an optional extra to our clients.

We are accustomed to completing this work as a part of a turnkey engineering service to the client, but also in the role of "owners engineer" whereby CPT acts as co-ordinator between the client and, for example, the primary equipment supply contractor.

Virtual Reality Simulation: " VR-SIM "™

For major new projects it can prove highly cost-effective to train operational teams using methods analogous to "flight training simulators" – i.e. CPT can deliver virtual reality simulations of the new plant, process, and machinery that use the client's own process control system (DCS, PCS, SCADA, PLC based systems) driven by a developed form of the original CLEAR-SIM process simulation mathematical models.

CLEAR-SIM is normally used to optimise the process design for the project. This forms the basis for the real-time simulator which is embedded into a powerful control platform with universal communication protocol compatibility. The simulator takes its input from the client's process control system and provides corresponding output to the PCS/DCS.

Almost all aspects of plant control can be realistically simulated (including group starts, sequential starts, steady state operation, unplanned failure events, process excursions, and non-steady state operation). Even hard-wired interlock functions can be emulated (depending on the specification of DCS/PCS system), e.g. Siemens PCS7 system interlocks are replicated using SimbaPro PLC cards.

The advantages of employing CPT virtual reality technology are:

- Short, effective start-up learning curves
- Intensive pre-testing of control systems and control logic.
- Field extension of system FATs (factory acceptance tests).
- Off-line training capability for new operational personnel (post start-up).

For a major rebuild it is certain that VR-SIM can prove highly cost effective.



Predictive Control System: "PCS-SIM"™

Using advanced data-mining tools such as neural networks, CPT can generate the complex algorithms required to accurately forecast exact finished product qualities in real time before the sheet has even been formed. By embedding these algorithms into the VR-SIM simulation system and linking the client's DCS or PCS, CPT provide the means of achieving true systemic process control – i.e. actual process variables are measured in real time, fed into the PCS-SIM system which, in turn, provides output of any key product variable.

These values are compared to the ideal benchmark standards (defined by the client), and control changes automatically made to any combination of real process variable set-points within the DCS/PCS in order to continuously optimise the finished product qualities (and quantities) in the most effective way possible.

PCS-SIM offers the ultimate in process control.

Quality Efficiency Management System - "Q-EMS"™

Q-EMS combines PCS-SIM predictive control technology with an array of transducers deployed on critical process system components. The result is a real-time, on-line monitoring and forecasting system that enables on-going optimisation and integration of the plant's component parts.

Sources of instability, or potential process excursions, are identified rapidly as root causes rather than symptoms, thus providing the data required for effective elimination of problems before they become detrimental to output, quality or cost.

Techniques such as TSA (Time Synchronous Averaging) are used to eliminate unwanted "noise". Q-EMS permits the accurate and effective identification of sources of instability, premature bearing failure, sub-optimal performance, etc. It provides a means of continuous monitoring and improvement.

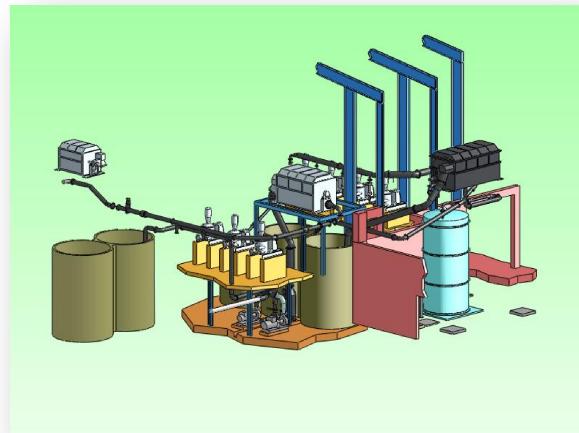
The expenditure involved in major outages, rebuilds or new primary assets provides an excellent opportunity to install Q-EMS and obtain accelerated achievement of full output potential.



CLEARWATER POWER TECHNOLOGY RESOURCES

CPT is a multi-disciplined engineering, project management and construction service provider. We are able to offer clients a very broad range of professional services, which include: -

- o Technical due diligence assessments
- o Transitional management
- o Site and asset management
- o Mechanical engineering
- o Electrical engineering
- o Process engineering
- o Chemical engineering
- o Automation and control
- o Cost management
- o Environmental services
- o Health and safety
- o Project management
- o Procurement
- o Turnkey process contracting
- o Programme management
- o Site implementation
- o Process Simulation and Modelling



All the above disciplines are delivered to clients from in-house resources by a well qualified and competent staff resource pool.

RESPONDING TO CHANGE

Manufacturing industry is constantly evolving. Alternative project delivery methods are now common place, and the traditional design-build approach is no longer the preferred method. An increasing number of clients are requesting single source procurement of engineering and construction management services. They require cost effective integrated solutions, intelligent and sustainable assets.

At CPT, we recognise this need and are keen to assume overall responsibility for timely and cost effective delivery of complex projects.

MEETING THE CHALLENGE

Whether the client requires a single engineering discipline or the full range of chemical, process, mechanical, electrical, civil, and environmental engineering, our services are available through a single point of contact: a designated specialist project manager is key to our effective and efficient service delivery.



Project staff are drawn from the specialist disciplines and moulded into effective market sector teams. Both the project manager and team members are selected based on their individual skills and expertise in the project sector and/or their prior experience with the project client.

CREATING SOLUTIONS

We recognise that technology in itself has no value, only the benefits it brings create value. We strive to ensure that we understand a client's needs. By combining the science of innovation engineering with the art of creative problem solving, we provide project specific design solutions which are functional, flexible, efficient and cost effective.

CPT also provides clients with services in all disciplines through our specialist partners and in many areas of special expertise including:

- o Equipment procurement and supply
- o Structural Engineering
- o Construction Management
- o Water Recycling Engineering
- o Renewable Energy sources
- o Standby Power
- o Sustainable Design
- o Architectural Lighting Design (internal & external)
- o Data and Communications
- o Corrosion Protection Systems

PROJECT MANAGEMENT

At CPT, Project Management Services is a company-wide services group providing project management and construction management services for a variety of multi-discipline commercial, industrial and government projects worldwide. In concert with our design capabilities, we provide complete project/cost management services.

Our professionals apply focussed, pragmatic, technical, analytical and creative expertise to projects that include water supply and treatment, wastewater treatment, power and energy, waste management, transportation systems, airports, railways, ports, buildings and structures.

Project management services include: -

- o Lead manager/Client's adviser/Owner's engineer
- o Brief development
- o Planning, feasibility and alternatives analysis studies
- o Economic analysis and whole life cost studies
- o Value Management



- o Value Engineering and assessment
- o Design coordination
- o Cost estimating
- o Program management
- o Construction management
- o Project cost and schedule control
- o Facilities management
- o Operations and maintenance planning

CONSULTANCY SERVICES

The main strength of CPT is the ability to focus on our clients, develop an understanding of their business needs and package the consultancy services to deliver the need. Involvement in the bidding and securing of EPC and BOOT projects has provided a further dimension in the understanding of client needs.

In order to deliver this service focus, a wide-ranging technical base is required. CPT has developed a broad based skill portfolio covering the paper industry, water industry, power sector, industrial sector, and commercial sector.

Skill areas range from pure consultancy in respect to feasibility studies, conceptual engineering, engineering reports and designs, through the provision of site supervision and monitoring services, to the drafting of the close down reports, operational manuals and training schedules. Experience of working in partnership and joint ventures with both the client and third parties has been extensively used to deliver projects to time, budget and quality.

To drive project costs down whilst complying with the legislative demands for safety, a pro-active approach to CDM, value engineering and risk assessment/management has been adopted. Senior exponents of the skills are actively involved at all levels of our service delivery.

Specialised services in respect to numerical modelling and simulation, (CLEAR-Sim, VR-SIM, ISS) together with Project Management tools, which integrate cost control with construction management, provide transparent project reports made available to our clients.

All projects are viewed from a holistic standpoint with the intent of focusing and managing the full range of CPT skills at all stages and levels of a project development to the benefit of the client.

HEALTH AND SAFETY

All of CPT's project and construction undertakings are carried out in accordance with recognised safety systems and procedures. CPT undertakes regular staff training and awareness to ensure all our staff, clients and the public are considered during all aspects of our project involvement.



Clearwater's philosophy is to work hand-in-hand with our clients to achieve a high standard of health and safety in every assignment, wherever the geographical location.

ENVIRONMENTAL SERVICES

Management of the Environment

CPT has a wide range of expertise within the following waste management fields:

- o Waste minimisation, reuse & recycling
- o Incineration
- o Gasification
- o Pyrolysis
- o Flue gas desulphurisation systems
- o Energy from waste / Energy Management
- o Consultancy services
- o Waste disposal
- o Treatment, storage
- o Transfer and transport of wastes

With our partners CPT provides advice on suitable reuse of waste for landscaping, construction work and land reclamation. The consultancy service offered includes planning liaison, negotiation with regulatory authorities, design, waste management strategies, waste minimisation, and contamination assessment.

Significant savings have been made for clients on landfill costs and off-site disposal costs where excavated material, construction waste and filter media have been beneficially reused.

We can offer the following environmental services:

- o Incineration and pyrolysis technology
- o Environmental impact assessment (EIA)
- o Environmental management
- o Environmental permitting
- o Due diligence auditing
- o Air quality monitoring
- o Pollution control trade effluent and wastewater management
- o Solid waste management
- o Regulatory advice
- o Expert witness
- o Emissions monitoring



PROVEN TRACK RECORD

We have a proven track record in delivering design and build, engineering, procurement, construction, commissioning and operational support as a seamless service to ensure safety, time, cost and quality to meet client requirements.

The core of project management, engineering and procurement activities are controlled centrally to ensure best practises are applied to all our projects.

Dedicated project managers and project engineers lead the project team from contract award to completion ensuring that customers' needs are understood and achieved.

An integrated suite of project tools enable the multi-disciplined teams to track time and costs to ensure that programmes and budgets are controlled and value for money achieved.

Our success relies on ensuring a clear understanding of the scope of work, employment of the resources best suited to carry out the function, clear understanding of roles and responsibilities of staff and the supply chain and the minimisation of risk.

APPROACH TO PROVIDING THE SERVICE

We recognise that to deliver our promise to the Client, our approach to any agreement must be one of addressed proactive teamwork. We assume responsibility to meet our commitment to the client, and will back this commitment with solid performance guarantees.

Our objectives are to: -

- o Form partnerships / alliances with our clients
- o Understand and share the Client's corporate, strategic and project objectives.
- o Appropriately disseminate this thought to the project team.
- o Provide proactive leadership.
- o Cost, time and quality under routine scrutiny.
- o Review team performance and maximise the skills available.
- o Reinforce the team to eliminate weakness.
- o Identify, select and use the most appropriate technology for the project.
- o Identify and closely monitor cost sensitive sectors.
- o Implement value engineering and management principles at all phases.
- o Apply sound environmental practice.
- o Apply appropriate health and safety principles

CLEARWATER POWER TECHNOLOGY



At an early stage, we can only provide an overview of our approach, however, we can assure any Client that, with the appointment of Clearwater, they will receive single source accountability - with the added promise that we will evaluate the Client's individual needs and constraints, then design a service delivery option that is tailored to meet those needs with optimum efficiency.

SUMMARY

We have the capability, resources, expertise, experience and geographical compatibility to provide any element of the evaluation, design, build, operational and management requirements of the Client.

CPT, as part of the Clearwater Technology Group, can provide a focussed, single source of expertise across a multi-discipline team environment.

Any information, in addition to this document, on CPT and our partners is readily available upon request.

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