John McCulloch's Curriculum Vitae

Personal Data:

Family name: McCulloch Fore-names: John Gordon

Birth: 1947 in UK. Nationality: British

Status: Married Gender: Male

Home address: Kinnen Dell, Bathgate, West Lothian, EH48 4NJ, UK.
Tel: +44 (0)1506-653095, email: jgm@intint.co.uk

Professional Qualifications:

1969: B.Sc. Hons., 2.1; Mechanical Engineering, University of Edinburgh, (with final year class prize in Control Theory).

1970: M.Sc. Systems Engineering, University of Strathclyde, Glasgow.

1985: Member of Institute of Measurement and Control. Chartered Engineer.

1993: Fellow of Institute of Measurement and Control.

Special Capabilities:

Environmental Recovery Technologies
I have generated a number of design proposals for the economic application of technology to solve the climate crisis.

Real-time dynamic modelling
of process and control systems for control system design, development and evaluation, and training simulators.

Operator interface design for real-time systems.
Has done considerable development work in optimising operator interface design for effective handling of upsets using both traditional DCS and Windows-based environments.

Alarm management philosophy and alarm improvement projects.
Recognised as a leading authority in this area.

Advanced process control
especially using classical algorithm-based techniques.

DCS
Experience of design, specification, configuration and testing.
Familiar with of Emerson DeltaV system.

Technical presentations at international conferences,
examples include: Alarm Philosophy; Alarm Improvement Projects; Operator Interface Design; Alarm Flood Reduction; dynamic modelling.

Training courses

and technical workshop facilitation.

Computer programming:

Languages: Pascal, Fortran, Visual Basic, HTML. Experience with MS Word, Excel, PowerPoint, Outlook, Access.

Miscellaneous:

French at survival/tourist level. Some (limited) Spanish, Dutch and German. Full UK driver's licence, no penalties.

Employment history:

October 2011 to present: Environmental Recovery Technology Design Engineer

Nov 1999 to September 2011: Independent consultant control engineer.

Aug 1969 to Nov 1999: Employer: BP Amoco plc., (formerly BP Chemicals plc, BP Chemicals International Ltd.)

Address at the time of my BP employment:

P.O. Box 21, Bo'ness Road, Grangemouth, FK3 9XH, UK.

As BP no longer has any presence at this address, for confirmation of my BP employment records, please contact: BP plc, 1 St James's Square, London, SW1Y 4PD

Tel: +44 (0)20 7496 4000

As Environmental Recovery Technology Design Engineer

I have produced a number of design proposals for:

- Generating electricity from wave energy from large oceans
- Heliostat domestic hot water in high latitudes
- Generating electricity from fast flowing water where no dam is possible
- Generating electricity from the Jetstream
- Solar powered air conditioning
- Solar powered desalination of sea-water
- Economic gas separation using continuous gas centrifuge
- Carbon capture scheme: 3.6 million tonnes of CO_2 per year for a capital cost of under $US 100 million
- Turning captured CO_2 into fuel economically
- Making internal combustion engines cleaner and more efficient by injecting water into the combustion chamber
- Improvements to wind turbine design

- Lifeboat design
- Separating sewage from storm water to prevent pollution of rivers and lakes after a storm
- A proposal for achieving zero landfill

Some of these documents can be found on my website:
www.intint.co.uk/eviron.html

For information about the rest, please contact me by email: jgm@intint.co.uk

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As Independent Consultant Control Engineer

June to September 2011 **Dynamic Training Simulator for LNG Plant:** for AMOR Group using Simulation+ on Emerson DeltaV platform. This was a model of an imaginary LNG importation plant for a training establishment. The work included: the process design of the LNG importation unit; development of new general purpose models for recondensers, LNG storage vessels and open rack vaporisers; simulation of multiple flow-paths through a large liquid filled pipe network containing many valves, pumps and vessels; handling of the thermodynamics of liquid-vapour equilibrium systems; a sequential control module for model start-up was provided with independent displays for the training supervisor to apply disturbances to the training session.

November 2010 to April 2011 **DCS Configuration and Training Simulator:** for Ineos Grangemouth. Re-instrumentation project for a chemical handling unit, (blending control). DCS configuration using Emerson DeltaV including regulatory controls, batch control sequence, operator displays, dynamic alarm setting and a full dynamic training simulator.

June to August 2010 **Dynamic Training Simulator:** of a North Sea Oil Platform for AMOR Group: control system and operator displays were copied from the real plant and linked to a full dynamic process simulation. All implemented in Emerson DeltaV using the AMOR Simulation+ package. Development of new general dynamic models for separators, exchangers, vessels and pumps; handling of multi-input liquid filled systems with parallel pump paths; refrigeration and dew-pointing systems.

April 2008: **Operator Interface Design:** For Real Time Engineering in Glasgow. Detailed design specification for plant overview displays for an oil refinery. Displays intended for a Honeywell Experion platform.

October 2007 to January 2008: **Dynamic Training Simulator:** For Real Time Engineering in Glasgow. Process modelling for a training simulator for a complex oil production platform - 13 HP separators, 3 LP separators, pumps in series and parallel, two parallel multi-stage compressor trains and associated equipment. Emerson

DeltaV platform. The work included development of generic process simulation objects and their implementation in the client system.

January 2007 to March 2007 **Control System Problem Analysis and Recommendations using Dynamic Modelling:** For Ineos Grangemouth. The cooling system for an exothermic polymerisation reactor had a control system that had been giving problems restricting plant throughput. A low fidelity dynamic model of the process with its control system was constructed using an Emerson DeltaV platform. Several alternative control systems were tested. A report was published containing recommendations for improving the performance of the system.

August 2003 to November 2003 **Test Engineer:** witness testing of batch/sequential control system (to FDA standards) for complex pharmaceutical application on Emerson DeltaV platform. Duties included preparation of test specifications, preparation and updating of functional design specifications, execution of witnessed tests, design and implementation of configuration changes to correct test failures.

November 2001 to January 2002 **Alarm Management Article:** provided an article for Belgian control engineering journal summarising the complete spectrum of alarm management issues: problems and solutions, with current best practice clearly defined.

June 2001: **Operator Training:** Provided 3 days of training to 2 teams of operators using a dynamic training simulator, (constructed in Feb/March 2000, on a Fisher Rosemount DeltaV platform, see below), for operators on a North Sea production platform, (through Real-Time Engineering Ltd., Glasgow).

May 2001: **DCS Configuration:** Assisted for 3 weeks with configuration of Fisher-Rosemount, (now Emerson) DeltaV system for North Sea Oil Platform reinstrumentation, (through Real-Time Engineering Ltd. Glasgow), during Factory Acceptance Testing: debugging of FAT failures, configuration of complex control schemes; sorting out control system integration discrepancies.

April 2001: **Slug Catcher Advanced Control System:** Design and configuration of slug-catcher advanced control system for North Sea Oil Platform, (through Real-Time Engineering Ltd. Glasgow), using Fisher-Rosemount DeltaV system. Algorithm-based advanced control system involving conditional switching of alternative control paths with multiple constraints and over-ride controls.

Feb. and March 2001: **Low Fidelity Dynamic Training Simulator:** Through Real-Time Engineering Ltd., Glasgow for Total-Fina-Elf's Alwyn platform. Configured in Fisher-Rosemount DeltaV system, the simulator emulated the Glycol regeneration circuit used to dry the gas being exported from a North Sea Oil Platform. Mass, component and energy balances were accurately simulated as were process dynamics; thermodynamic properties were

represented by simple polynomials, accurate at design conditions; separation processes were represented by lumped parameters accurate at design conditions. The system used identical displays and control system configuration to the real system, and included emulation of ESD and motor control gear logic. Building the simulator required integration of both sequential, (batch), and continuous control systems with the simulated plant and linking those with the Fix-Dmax displays. The system resided on a single high-specification lap-top computer for easy transport to the off-shore platform.

With BP Chemicals, Grangemouth

1997 to 1999: **Applied Manufacturing Technology Consultant,**
Operations Support Group

- Communication with suppliers, especially Honeywell and Foxboro, over BP's long-term technology development needs.
- Member of the Honeywell European User Group Steering Committee, and of its Operator Interface Work-shop. In the latter, he took the lead in producing several important documents including Alarm Management Philosophy for Screen-based Systems, Dynamic Alarm Modification, Project Implementation Guidelines for Alarm Management.
- Networking with other BP and Amoco sites over technology issues, especially operator interface design and alarm improvements.
- Trouble-shooting of process control problems. Has a reputation for tuning difficult control loops, or finding out what is wrong with the process or control system design.
- Alarm improvement projects: Kicked off and supervised alarm improvement projects on several older plants. Provided consultancy in this area to another company, (SASOL SA).
- Revision and development of BP Recommended Practice for alarm management and operator interface design.
- Preparation of alarm management strategy for new plant projects.
- Specification and detailed design of operator interface using MS-Windows technology in Honeywell GUS for a re-DCS project on G4 Ethylene plant.
- One of a three-man team who together developed an initiative to integrate manufacturing technology across the supply-demand network. This has since developed

into a Manufacturing Vision policy and is being widely promoted within BP.
- Provided a short course: Advanced Control and Optimisation for Process Engineers.

During this period, presented a number of papers at large international conferences, including: Operator Interface Design, Alarm Management Philosophy and Alarm Improvement Projects. Has gained a reputation as a very good speaker and is openly solicited to give presentations.

1993 to 1996: **Process Systems Superintendent,** Technical Development Department

Line Management and Technical Supervision of fifteen specialist engineers and two clerical staff. These highly qualified staff included several with post-graduate degrees working in the areas of DCS configuration, advanced control, modelling, simulation, plant optimisation, high accuracy fiscal metering, tank gauging and real-time site-wide database. The activities of the section included:

- Commissioning and long-term support of two olefins plant closed-loop optimisers, linked by a supervisory optimiser;
- Use of dynamic model-based control in a constraint-bound non-linear situation: extractive distillation;
- Development of dynamic optimisation of grade-transition for multi-product plant;
- Provision of site-wide real-time database for production management and accounting;
- Development of human factors knowledge to ensure that plants are managed efficiently during steady operation, and effectively through disturbances.

Although performing this job well, found management of people unacceptably stressful during a period of recession when the requirements for the long-term support of scarce technical resources conflicted with the short-term demands of accounts-led management. Management work-load and interruptions also prevented exploring and promoting the leading-edge development of control technology: the area I found most interesting.

During this period, was invited to become a member of the Honeywell European User Group Steering Committee as a result of a paper on Improving the Honeywell TDC Algorithm Set.

Was appointed Chairman of the Honeywell User-group in 1995, and thus gained experience in communicating with a large international audience, (400 people from 25 countries).

1990 to 1993: **Control Engineering Superintendent,** Technical Development Department

- Line Management and Technical Supervision of a team of initially five, and building up to eight, specialist Control Engineers. These were all highly qualified staff including two Ph.D. and several with multiple degrees working in the areas of DCS configuration, Advanced Control, modelling, simulation and plant Optimisation.
- Consultation over the primary and advanced control design for a new ethylene plant including use of dynamic simulation for solving complex control problems.

1986 to 1990: **Senior Control Engineer**, Technical Development Department;
Technical management and guidance, (but not man management), of one contract control engineer, two BP control engineers and a graduate trainee.

- Feasibility studies, cost-benefit analysis, design, specification and technical support of closed loop optimiser for an ethylene plant.
- Configuration of Foxboro Spectrum DCS for re-instrumentation of an ethylene plant. Development of conventional advanced control on this system.

1983 to 1986: **Control Engineer**, Technical Development Department;

- Detailed design, specification, installation and commissioning of digital control systems.
- Design, development, installation and commissioning of conventional advanced control schemes for distillation columns and hydrogenation reactors. This pioneered the first beneficial use of computer-based advanced control on the site.

1981 to 1983: **Instrument/Electrical Engineer**, Technical Section;

- Detailed design, specification, procurement, installation supervision, configuration and commissioning of supervisory control computer and interface hardware for a large ethylene plant with pneumatic instrumentation. Included detailed design of custom computer to pneumatic interface for existing pneumatic

panel instruments, (Taylor PQS).
- Dynamic simulation of a complex gas distribution system for control system design.

1976 to 1981: **Instrument/Electrical Engineer**, Instrument/Electrical Department;

- Instrumentation and control systems project work, (specification, procurement, installation and testing), for a new Ethanol and Benzene plants. This included high reliability emergency shut-down system, analogue panel instrumentation and process control computer.
- Detailed design, installation and commissioning of high reliability emergency trip system for three steam turbine driven compressors on an ethylene plant.
- These were the first instances of ultra high reliability all-electronic emergency shutdown systems and involved strategic development work, risk analysis and detailed design in close liaison with the vendor, (Rochester Instruments and Systems Ltd.)

1972 to 1976: **Instrument/Electrical Engineer**, Engineering Services Department;

- Instrument and electrical estimation, development work and trouble-shooting.
- Detailed design of analogue electronic control systems for two-stage ethylene pipeline letdown station. Included mass-balance control, constraint control and continuous control through alternate process line-ups. This was a high reliability system designed for zero down-time.
- Reliability analysis of emergency shut-down systems with poor incident history.
- Mathematical analysis of polymerisation reactor dynamics for control system design.
- Computer dynamic simulation of a polymerisation reactor and subsequent process and control system design modification proposal to contain possible reaction runaway.

1970 to 1972: **Plant Instrument/Electrical Engineer**, Instrument/Electrical Department;

- Ad hoc plant instrument/electrical maintenance, (cover for absence, trouble-shooting);

- Re-instrumentation of two ethylene plant boilers, (pneumatic controllers, electronic recorders and alarms plus relay ESD system in local control room).

1969 to 1970: **Trainee Plant Instrument Engineer**, Training Department;

- Induction and initial graduate training at BPCI.
- Secondment to University of Strathclyde, Glasgow for M.Sc. in Systems Engineering.
