

ING. LIVIO DANTE PORTA 1922 - 2003

Ingeniero Livio Dante Porta dedicated his life to the advancement of the steam railway locomotive. His love of steam was, as with many, seeded at an early age. During World War II Porta worked on the railways of Argentina as an enginemen, gaining much of the first hand knowledge and experience which was to guide his future path.

In 1946 at the age of 24 he graduated from the National University of the Litoral, Rosario as a civil engineer. At this time there were no other formal engineering courses being offered in Argentina. However he did not wish to become anything other than a locomotive engineer so he educated himself in all the relevant areas. This education included mastering several languages including French, German, English and even some Romanian. Why? Because it meant he could understand almost all of the serious texts on mechanical engineering and railway locomotives. He appreciated this would be essential if he were to produce any worthwhile results. It was during this period of self-education that he started to correspond with the greatest locomotive engineer of the era André Chapelon of France. The two were to become firm friends, despite the occasional technical argument! Chapelon was soon to realise that Porta was one of the outstanding locomotive designers of his generation. In turn Porta realised if the steam locomotive was to reach its maximum design potential experimentation had to be conducted in a much more rigorous fashion than had been the case. It can be said this philosophy was to drive him throughout his career and points to why he had so much success. This can perhaps be summarised as “no more good enough engineering”, something which he was to impress on the world. Just because a locomotive could do a job didn't mean it would do it very well.



In 1949, at 27 years of age, Porta saw his first locomotive completed. The streamlined metre gauge 4 cylinder compound 4-8-0 named ‘ Argentina’ was painted in the white and blue colours of the Argentine flag and was the first locomotive to be built in Argentina. This locomotive incorporated much of Chapelon's thinking but took it further. In the process, at his first attempt, Porta had produced a world beating locomotive equal to anything his great mentor Chapelon had produced. However Porta's ‘ Argentina’ was to remain a one-off. The railways chose a different path which ultimately lead to the eradication of steam. But there were many years left and many improvements Porta was able to make to existing steam locomotives within his home country. Light modifications of two classes of 5'6” gauge locomotives of the Ferrocarril Nacional General Roca (FCGR) were extremely successful

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enabling the modified locos to out perform much larger standard locomotives. Key to their modification was the Kylpor exhaust ejector which was considerably more efficient at creating smokebox vacuum than the original arrangement. He also concentrated on improving the detail design of the locos to remove many of the annoyingly regular maintenance tasks. He showed through thoughtful design such tasks need not exist. Such work did not go unnoticed!

Argentina has only one major coalfield – that at Río Turbio in southern Patagonia. A railway, Ramal Ferro Industrial Río Turbio (RFIRT), existed to take the coal from the mine on the west side of the country to the port on the other side. This 75cm gauge line was operated with Mitsubishi built 2-10-2s which were not proving very successful. Río Turbio coal was far from ideal loco coal and as such many problems were being encountered including heavy clinkering and low maximum sustainable outputs.

So in 1957 he and his young family moved to the South Atlantic coastal town of Río Gallegos, the then headquarters of RFIRT operations. With a clear objective in mind to revolutionise the operations of RFIRT, Porta set to work. Within a few years the modified 2-10-2s were proving to more than master of the task. Regularly hauling over 2000 ton trains, the small locos were producing over 1300dbhp, a figure which would still put many larger gauged locos to shame. All of this was achieved with Río Turbio coal but burnt with the Gas Producer Combustion System (GPCS) adapted to loco use by Porta. GPCS was to become a major part of Porta's future work as it showed even poor grades of coal could be burnt cleanly and without clinker formation.

The RFIRT work came to the attention of Hunslet in the UK who adapted the GPCS and Kylpor for use on their Austerity type industrial service 0-6-0 tank locomotives. This work was the first example of Porta's work outside of Argentina. On tests conducted by the British Railways Western Region it was shown the modified engines could sustain 12000 lbs of steam per hour compared to barely 6000 lbs of steam per hour for a loco in original format. Impressively 900dbhp was available from the locos. Approximately 70 National Coal Board

locos were modified and many can still be seen in use in the UK.



In 1963 a second batch of 2-10-2s were built for RFIRT by Mitsubishi. These machines incorporated all of Porta's modifications to the first batch plus some additional ones. On test these locomotives were able to show even better performance than the modified ones of the first batch.

It was typical of Porta that he soon moved on from Río Gallegos. Having achieved what he set out to he left it to others to continue the operation. He did not want to be the only one with the knowledge; without spreading understanding of his work it was doomed to fail. So from the far south of Argentina he returned to the capital where he took up a post with the state agency Instituto

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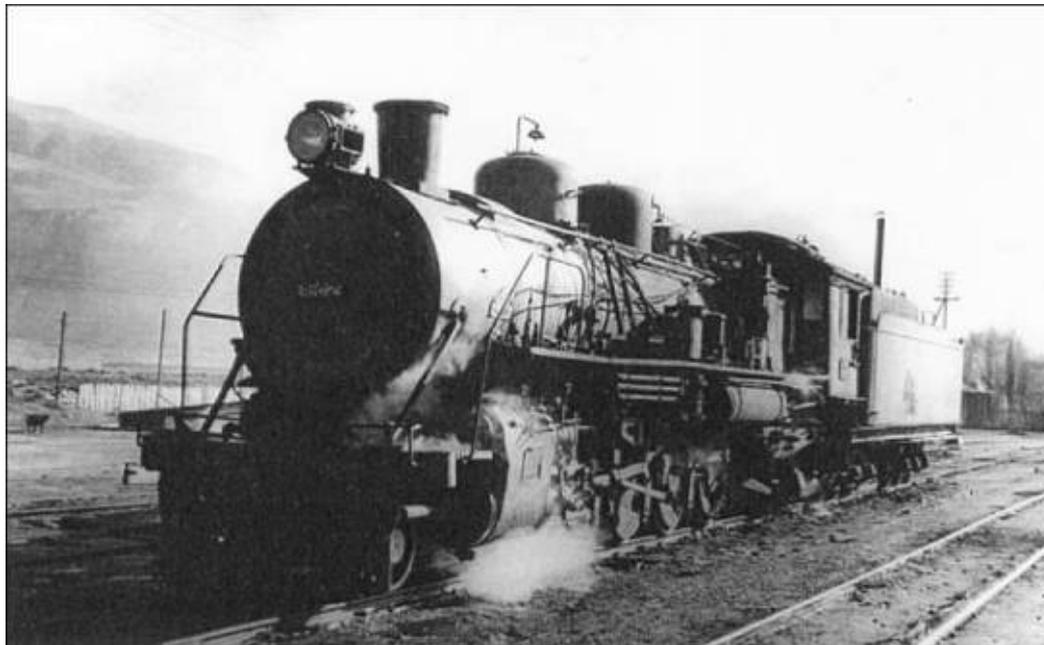
Nacional de Tecnologia Industrial (INTI). Here he was the head of the Thermodynamics Department until formal retirement in 1982.

The period at INTI saw a great deal of theoretical work undertaken, much of which was written up in over 200 technical papers produced during his life time. It was perhaps the most productive period of his life. One notable piece of work was a paper, "Steam Locomotive Development in Argentina – Its Contribution to the Future of Railway Technologies in the Under-Developed Countries", presented to the Institution of Mechanical Engineers in 1969.

The INTI era also of course saw him at work on locomotives. He worked his magic on a metre gauge 4-6-2 showing how that too could be adapted to burn Río Turbio coal. Naturally in other ways the locomotive was also significantly enhanced. However the most important locomotive work of this period was conducted on another metre gauge machine. Class C16 4-8-2 No.1802 was, between 1969 and 1974, his mobile test bed for a whole host of trials.

No.1802 is primarily remembered as being the locomotive on which the Lempor exhaust ejector was perfected. The Lempor history can be traced back to the FCGR work of the mid 1950s but on No.1802 Porta finalised the design and produced what is still the most efficient exhaust ejector for steam locomotives. Smokebox vacuum created in relation to cylinder back pressure was much higher than any system that had come before other than his own Kypor which produced very similar results. Why? Because of the application of sound scientific principles in design and experimentation.

No.1802 was also the locomotive on which he developed at the request of the Argentine railway authorities Porta Treatment (PT). This advanced internal boiler water treatment regime had to prove itself in the harshest of conditions and did. Boiler washouts were reduced from once a week to once every six months and the two year interval between heavy boiler repairs was extended to such an extent heavy repairs were no longer required! The use of PT extended the life of steam in the northwest of Argentina by several years.



Following No.1802 there was something of a hiatus in terms of hands on locomotive work. However Porta was far from idle! During this period he acted as long distance consultant to British born engineer David Wardale, then working on South African Railways. This fruitful relationship developed as Wardale modified two locomotives in line with Porta's principles. The second of these, Class 26 4-8-4 No. 3450, best known as the Red Devil, was named 'L.D.Porta' when completed in 1981.

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The early to mid 1980s were busy years. Engaged by American Coal Enterprises (ACE) as technical vice-president Porta was one of a team enlisted to design a thoroughly modern steam locomotive from scratch to compete head on with diesel locomotives. With Wardale as his deputy a series of tests were carried out on the mainline with Chesapeake & Ohio Railroad 4-8-4 No.614. These spectacular tests produced some interesting and useful data but ultimately can be seen as the high point of the ACE project. Lack of funding and a fall in the price of oil saw the project collapse.

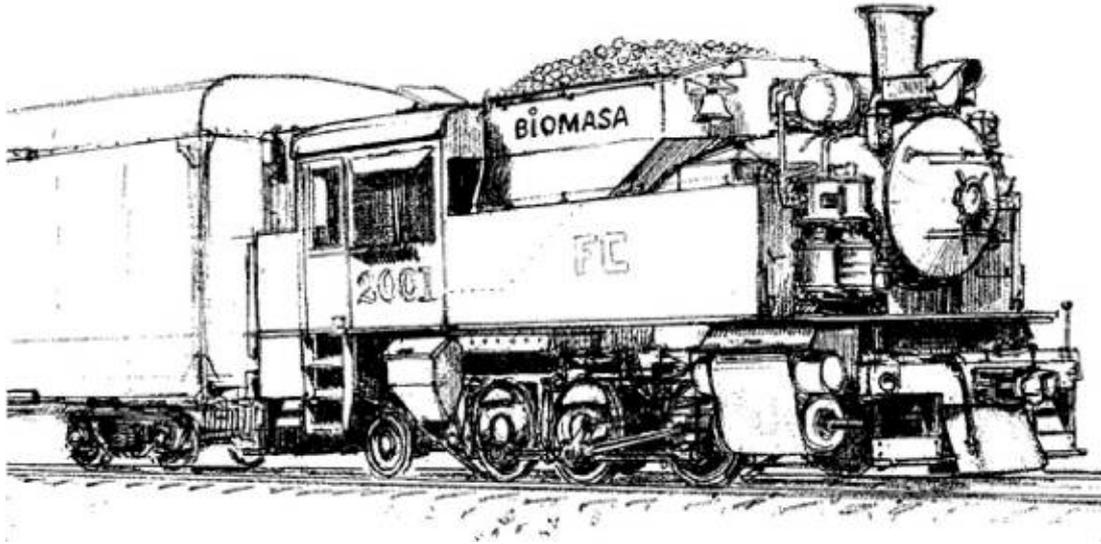
Porta returned to Argentina and despite being of the age many would consider starting a quiet retirement such things were not for Porta! Jobs continued to come his way between further research and acting as a long distance consultant to various projects.

The early 1990s found Porta in Paraguay and Brazil. The Paraguayan job was the only one which Porta ever walked away from – normally he would put up with whatever was thrown at him. His determination to better the steam was that strong. However Paraguay proved impossible for a number of reasons. Even so the partially completed modernisation produced a loco using just 30% of the fuel it had used in original form!

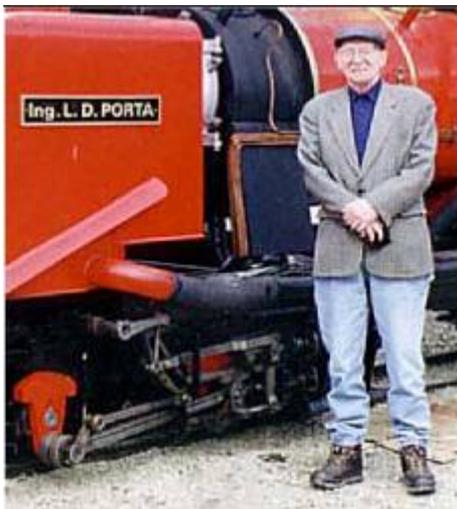
In Brazil, on the Doña Teresa Christina coal system, Porta once again applied his Gas Producer Combustion System and other trademark modifications to many of the locomotive fleet. Interestingly some of the 2-10-2s modernised were the same class the RFIRT 2-10-2s had been scaled down from! It was here that Porta was to work with another British engineer. Phil Girdlestone had already applied Porta's technology on the Ffestiniog Railway and in Sudan. From Brazil Girdlestone moved to South Africa to apply Porta technology to 2' gauge Garratts with the long distance consultancy of Porta. He remains there to this day modifying locomotives on a contract basis around the world.

In the early 1990s on hearing of the plan to build a replica Class A1 4-6-2 in the UK he voluntarily submitted a detailed and lengthy proposal to the A1 Trust for an A1 look-alike which would have produced over twice the power of the original. However this idea was passed over and the opportunity missed.

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The next American country to contract Porta was Cuba. With the vast number of steam locomotives in use it is surprising it hadn't happened sooner. Standard gauge ALCO 2-8-0 No.1816 was given a heavy rebuilding with predictable results. Originally the rebuilding was scheduled to take 6 months. In the end it took 6 years! Such is life in Cuba. With No.1816 showing what was possible, Porta and a team of Cuban engineers set about designing a brand new 0-6-2 tank locomotive for shunting and branchline duties. Then the bottom dropped out of the sugar cane market, the money available evaporated and the project was shelved. However the design is there and if the money were available could be built with little further work being required.



In parallel with the Cuban work Porta acted as an adviser to Roger Waller of Schweizerische Lokomotiv und Maschinenfabrik(SLM) who had secured a contract to build a series of new rack tank locomotives for Switzerland and Austria. He was also contracted as a consulting engineer to a new tourist railway, Ferrocarril Austral Fueguino (FCAF) in Ushuaia, Argentina. This line took the title of the worlds most southerly from RFIRT. His work there rapidly lead to yet another Britain, Shaun McMahon, then working with Girdlestone in South Africa, to become technical manager of the line. Again with Porta as consultant McMahon revolutionised the locos of FCAF which by any standards were seriously unsuitable for their task. In honour and recognition FCAF No.2 an 0-4-0+0-4-0 Garratt built 1994 (and erroneously claimed to be the first

locomotive constructed in Argentina) was named 'Ing. L.D.Porta' on re-entering service in 2001 after a heavy rebuilding.

By this time Porta knew he was entering the twilight of his life. However his energy and enthusiasm remained undiminished. Right up until his death on 10 June 2003 he was hard at work making sure those that followed him understood his philosophy and technologies.

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