



# CAMPSAHONDA NSR2501989

Reinhold Roth in tears on the Rijeka rostrum summed it all up, after being outfoxed yet again by the Spanish ace in the last lap run to the flag: "Won't you at least let me win one race?" he asked.

HRC certainly helped fuel this supremacy by giving Sito maximum support throughout the season, especially after Yamaha threatened to win back the 250GP title after the first four races. There's little doubt that Japanese rider Masahiro Shimizu performed a little-known but vital development role in this respect, testing new components and engine settings in early qualifying that were incorporated in Sito's bike for final practice and the race if they worked, even to the point of the Japanese rider's

engine being fitted in Sito's bike for race day, if considered desirable.

Finally, as in 1988, the influence of Antonio Cobas can't be overestimated. The Spanish designer found time from his own team's successful assault on the world 125 title (in which his rider Alex Criville ironically defeated both works Hondas to win the championship!)



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to work his technical wizardry on the chassis of Sito's bike. With the best engine, the best chassis set-up and the best rider, is it any wonder that the Campsa Honda team retained its world title in 1989?

## The why

In attempting to duplicate Spencer's hard-fought 1985 world championship victory on the unique NSR250, Honda got badly blindsided in 1986 by the total dominance of Carlos Lavado on the Yamaha YZR250, who won six GP races en route to the title.

As HRC director and Honda GP boss Yoichi Oguma told me when I tested Shimizu's bike at Suzuka, Honda had made the mistake of completely redesigning the internals of the engine compared to Freddie Spencer's unique title-winner from the year before. "We should have had confidence in our existing development skills, not done so much work on redesigning a proven winner," he said.

So for 1987 the third-generation machine contained no major design changes, only a host of small improvements and tweaks which together resulted in a Formula Honda steamroller – Honda riders taking the first five places in a world championship table topped by wily West German veteran Toni Mang.

It looked like it was going to be Pons' year at the start of 1987, until a fall in practice at his home race in Jerez gave him a painful hand injury which hampered him for a good part of the season. Despite that, Sito scored points in every GP except Sweden, where what the

A long swingarm helped stability on the fastest parts of the track.

Japanese termed 'ignition trouble' (factory Hondas never officially seized!) caused his only mechanical retirement that year.

### The technical

Unlike its 1987 NSR500 V4 sister bike, on which the vee angle between the cylinders was opened out to 112° in order to increase reed valve area, locate the carbs between the cylinders and obtain an improved exhaust line – that year's NSR250 kept the Spencer bike's 90° V-twin configuration.

That meant it didn't need a balance shaft to eliminate vibration, which Honda boss Oguma said would have sapped vital power, as well as making the engine unnecessarily heavier and more bulky.

But the change to two separate roundbodied 38mm Keihin aluminium carbs was purely on the grounds of cost. With the bike already on the 90kg class weight limit, Honda didn't need to go to the expense of employing the expensive magnesium twin-choke single-body Keihins used on the NSR500 and indeed on Spencer's NSR250 title-winner two years earlier.

Honda's main development over the winter went into that traditionally fertile area of design for the two-stroke engineer, the cylinders. Instead of the ATAC-equipped 1986 engine with its variable-volume exhaust system, Honda engineers adopted a Yamaha-like variable exhaust port power-valve system, actuated by an electric motor controlled electronically off the tacho.

At the same time, they reworked the five transfer/single exhaust port cylinders and revised the exhaust system which, on a twin-cylinder 250, doesn't take up so much



room as on a four-cylinder 500, which in turn means that pipe design isn't compromised by space limitations.

Still, the rear-mounted carbs did mean that the left-hand pipe curved round from the forward-facing exhaust port, probably offering a less ideal shape than its partner, which









### HONDA NSR250 1989

Engine: Water-cooled crankcase reed-valve 90° single-crankshaft V-twin two-stroke with electronic power-valve Dimensions: 54 x 54.5mm 249cc Capacity: Output: 82bhp at 12,600rpm 2 x 38mm Keihir Kokkusan electronic CDI Ignition: Gearbox: 6-speed extractable Clutch: Multiplate dry (5 fibre/6 steel) Chassis: Extruded aluminium twin-spar frame Head angle: 22-26 degrees (adjustable – usually 22 degrees) Wheelbase: 1330mm Weight distribution: 56/44 % Suspension: Front: 43mm Showa telescopic forks (no antidive). Rear: Fabricated aluminum swingarm with Showa monoshock and Öhlins Pro-Link variable-rate link Brakes: Front: 2 x 275mm discs with Nissin four-piston calipers. Rear: 1 x 185mm disc with Nissin Front: 12/60-17 Michelin Wheels/ tyres: crossply on 3.50 in. Marchesini cast aluminium wheel. Rear: 15/61-17 Michelin radial on 5.00 in. Marchesini cast aluminium wheel Weight/distribution: 92kg with oil/water, no fuel, split n56/44% Top speed: 162mph (Hockenheim, 1989 German GP) Year of construction:

> Honda Racing Corporation, Shizuoka, pan, leased to Campsa Honda Racing Spain

exited straight from the bottom rear side of the right port. Presumably, the increase in vibration which would have been noticeable on a singlecrank V-twin had they increased the cylinders' included angle from 90° to the 112° of the 500, mitigated against putting the carbs in a forward-facing position in a wider space between the cylinders as on the 500 - which would have offered a superior exhaust run, as Yamaha later discovered with their V-twin TZ250.

On a V4, the slight increase in primary imbalance would be less noticeable.

The result of HRC's modifications to the 54 x 54.5mm engine was to raise declared output to 80bhp at 12,800rpm, but more importantly to also improve bottom end torque and midrange performance.

On a tight track like Calafat where I rode Sito's 1987 bike post-season this was especially noticeable. The Honda seemed to leap out of second-gear corners with noticeably added zest compared to the Rotax-powered Aprilia of Loris Reggiani that I'd been riding an hour earlier.

The fact that the slightly bigger Honda fitted me better than the low-slung Italian bike was a bonus, but I felt better able to power out of turns on the Aprilia because it handled more nimbly, yet it was the Honda which I actually went quicker on, because of its superior torque. This was a highly rideable bike that on many circuits would have been far easier to ride, and even capable of lapping faster, than its V4 500cc cousin.

I'm not ashamed in admitting that on Shimizu's NSR250 I'd lapped Suzuka faster on a cold, slightly damp day than I did on Wayne Gardener's titlewinning NSR500! Yet according to Oguma this was all predictable: "The target for our NSR250 GP project team is to beat the 500cc lap record at both Tsukuba and Sugo circuits," he said. "Already they are very close, and with the sort of performance we are now achieving with our NSR250, together with its light weight and easy

From the front you can see just how narrow the NSR was. handling, I think it will not be long before they do this." [They did! - Fd1

Owner:

Maximum power on the 1987 NSR250 was delivered at 12,100rpm, but it pulled hard from around 8,500 revs, giving an acceptably wide usable spread of power, though there was zero overrev - power tailed off abruptly after 12,400rpm or so. But it felt so strong for a 250 - more like a 350 in the

old days compared to a 500 - and the cassette-type gearbox enabled swift ratio changes.

However, even at my reduced speed compared to Sito I could discover the traction problems with the bike thanks to its ultra-short 1310mm wheelbase and far forward 56/44% weight distribution, which Oguma's engineers had opted for in an attempt to make the Honda turn as nimbly as the more agile,

> but slower, Yamahas. Exiting the two tight turns at the northern end of the Calafat track the rear Michelin radial would spin up repeatedly, even with my heavier weight on board.

I also found that the bike became unsettled if you braked very hard, the back wheel streetsweeping around in the air. This was surely a factor of the extreme forward weight bias of Honda's new chassis for the NSR250 that season, cleaner and neater but also more sturdy than previous designs, weighing close to the 90kg class weight limit,

But this frontwards accentuation of that weight, coupled with the excellent braking performance of the twin 270mm Nissin discs and their four-piston calipers, was certainly responsible for the instability under braking that had made Honda riders like Sito susceptible to rushes up the inside on the part of hard brakers like Loris Reggiani and the Yamaha-mounted Luca Cadalora. I also wasn't happy with the way the Honda washed out the front wheel as you turn into certain bends in second or third gear. Surprisingly,



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the steering head angle of the 43mm Showa telescopic fork was fixed at 23°, and trail could only be altered by raising or lowering the ride height at the rear - there were no alternative tripleclamps!

To resolve these handling problems for 1988 Sito went back to the future and enlisted the aid of his near neighbour and former chassis engineer Antonio Cobas, to work alongside his crew chief Santi Mulero in refining the setup of the NSR250 frame.

The 1988 NSR250 with which Sito won the first of his two world titles was effectively an entirely new bike, albeit still directly derived from Freddie Spencer's 1985 world champion. Mang's 1987 title-winner had scaled right on the FIM's 90kg minimum weight limit for the 250 class, leaving Honda with the right kind of problem – where to add weight, rather than reduce it.

Oguma confirmed this: "We could easily reduce total weight to 85kg with no problem, and not too much expense.

"We therefore have paid close attention to improving the handling and reducing frontal area. For this reason, in redesigning the NSR250 engine for 1988, we narrowed it only by 3mm, but also shortened it by making the primary gear smaller and rotating the gearbox shafts slightly so as to bring the whole gear cluster closer to the crank. The advantage of this is to reduce the polar moment for improved handling. We also have a little more power than before!"

Since the 1987 NSR250 was officially declared to yield 80bhp at 12,800rpm, we may safely take it that the 1988 title-winner churned out about 82bhp, probably peaking at 12,500rpm or so.

Oguma-san wouldn't confirm that this time, though! Honda achieved this with the aid of new cylinders and pipes (though they surprisingly used the same design for all tracks and conditions), still incorporating the electronic power valve introduced for 1987 to replace the ATAC system used hitherto.

And HRC still hadn't opened up the included cylinder angle to 112° as on its NSR500 V4, though Yamaha did do this for 1988 on both its 250 and 500 twin-crank YZR designs, to offer a greater reed valve area, and improve carburation.

If the engine was broadly as before, the 1988 NSR250's chassis received a lot of attention over the winter. The extruded twin-spar alloy frame was not only tidied up but became stiffer and a little more compact, while the wheelbase was lengthened slightly to 1330mm to redress the 1987 NSR250's lack of traction exiting turns. At the same time, the beefy



43mm Showa front forks lost their TRAC brakeoperated antidive setup, in favour of a plain single-rate spring coupled with a pro-squat rear end linkage and some sophisticated front end damping. Shimizu's bike appeared at Jerez with carbon fibre fork sliders but these were works specials which the lease NSRs weren't supplied with - and that included Sito's Campsa team. But a major difference for all NSRs that season was the fitting of a curved radiator, which enabled the objective of reduced frontal area to be met, even with the single-crank engine which was inherently wider than the twin-crank V-twin. As well, the more compacted engine mass was moved closer to the front wheel.

Cobas' modifications to the 1988 NSR250 consisted of a completely new rear suspension link to offer an improved curve to the rising rate, alterations to the Showa rear shock itself, an altered shape to the fuel tank to revise weight distribution with Sito in place, a revised seat with the underside faired-in completely to offer less of a pocket for slower bikes (i.e. Garriga's Yamaha!) to slipstream the faster Honda in down the straight, and much else including general setup at the track.

Sito said: "Some riders just like to just get on the bike and ride it.

'But I prefer to spend as much time as possible at each circuit experimenting, so as to get the best possible setup. Having Antonio with us that year halved the time it took to achieve that, simply because he could predict the likely effect of each small change we made so accurately that we could decide in advance whether it was worth doing or not.



"One of the problems with last year's bike was that it wouldn't steer fast enough for me into turns," explained Sito at the time. "Antonio altered the steering geometry and weight distribution by raising the rear end and making other changes to the front, as well as redesigning the fuel tank, so that now we have more weight on the front wheel, a steeper effective head angle, and a much quicker steering bike than the one Honda sent us. It was a crucial factor in our success this season."

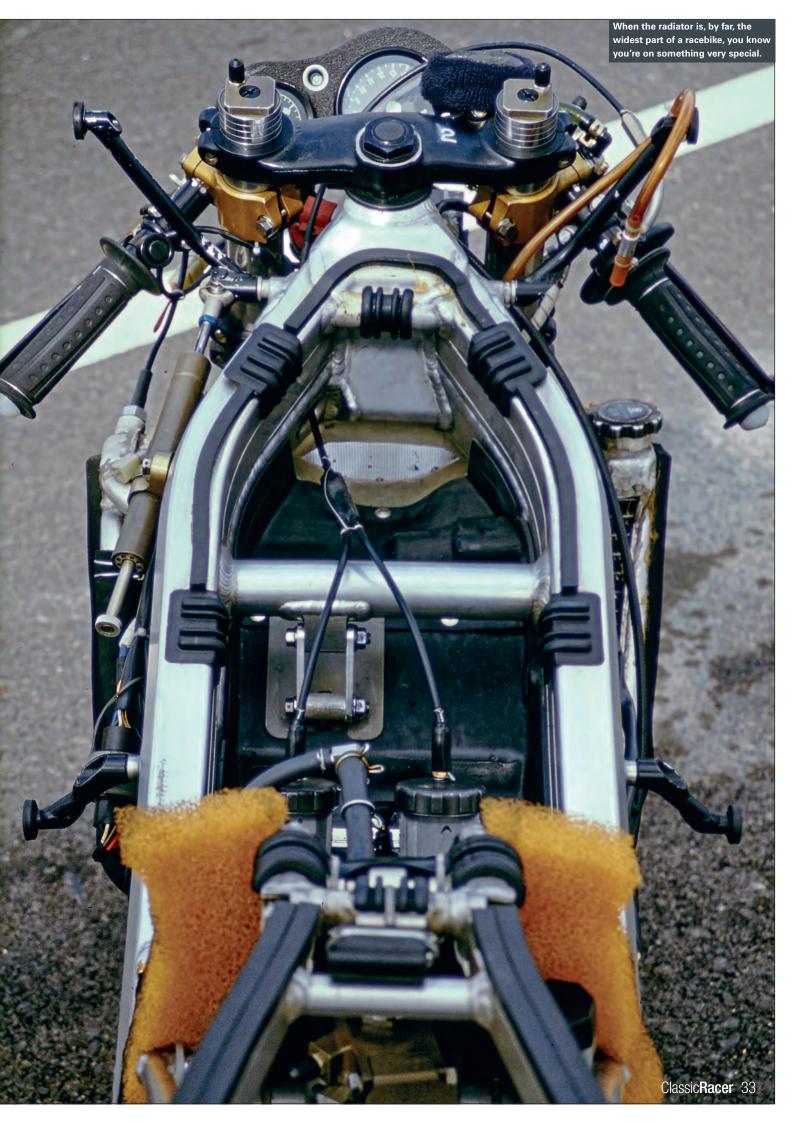
The fact that he had the most horsepower in the class while revelling in such a rideable bike was one reason Sito's Honda was so hard to beat that year - but it also puts into perspective Juan Garriga's remarkable performances on the slower, but nimbler Yamaha. "The Honda and the Yamaha accelerate much the same," said Sito: "but my bike is definitely faster in midrange and top speed. However, Reggiani's Aprilia is even faster still on absolute top speed, just that it doesn't have such a good power delivery, and certainly doesn't handle so good. But even with the modifications we made to my Honda this year, the Yamaha still handles better, especially on the way into a turn."

The Cobas modifications to Sito's Honda ensured that it steered almost as fast as a JJ-Cobas, but with more finesse, and a lot more controllably. You could round corners practically on autopilot, and the few remaining bumps of the freshly resurfaced Calafat circuit were easy meat for the smooth-action rear suspension.

But for 1989 in providing Sito with a bike to defend his title with, Honda delivered that track tester's nightmare: the perfect race bike!

The 1988 version at least had the soggy and inadequate brakes for me to criticise, but since then Nissin had obviously done their homework, and the result was a front brake setup that could be caressed with a finger if you just wanted to scrub off a bit of speed going into the chicane behind the pits at Calafat, yet gave impressive, instant braking for the hairpin at the end of the main straight. Sensitivity, coupled with stopping power - in spite of the smaller 275mm front discs that Sito used (his fellow Honda riders fitted bigger 290mm discs, which increased unsprung weight and had an increased gyroscopic effect on the steering).





### Cobas' influence

The extent of Cobas' work on the NSR250's chassis development was implicitly recognised by HRC in October 1988, when they went testing at Jerez with their 1989 prototype and enlisted him as a consultant to advise on the new bike's chassis design.

That early test ensured that the 1989 Honda looked much more like Sito's Cobas-modified 1988 machine than before, even if HRC failed to incorporate all Antonio's modifications in the revised 1989 model. Thus while they altered the riding position from 1988, so that as on the Cobas-modded version the fuel tank was shorter and fatter, and also increased rear suspension travel by 2mm to 118mm on the Showa shock, there was still plenty for Cobas to do when he got the bikes back to Europe after the first three overseas races.

His modifications, originally unique to Sito's bike but then largely emulated by HRC on Shimizu's machine included:

- raising the rear ride height to effectively steepen the head angle and increase front end bias further
- making up a range of eccentric cups to permit further variation in the head angle – average setting was an ultra-steep 22 degrees
- covering in the bottom of the seat to close off the slipstream and reduce the possibility of being drafted by a slower bike (i.e. Yamahas!)
- making a completely new rising rate link for the Showa shock to offer a different curve
- designing the pro-squat rear brake linkage, though for internal reasons this was made by Honda to Antonio's specification and

was not available until almost mid-season.

But while it was the Cobas modifications to the chassis which made the Campsa NSR250 stand out from the clutch of other Hondas that season, it was the performance of the 90°V-twin single-crank crankcase reed-valve engine that was responsible for Hondas' supremacy over their Yamaha and Aprilia rivals.

After their subtle redesign for the 1988 season, HRC initially made few changes to the engine for 1989. But once the extent of Yamaha's threat became apparent in the first few races, Honda stepped up development dramatically, using Shimizu's bike as a rolling testbed for the work that would eventually earn them their third 250cc world title in a row.

The electronic ignition had a range of five different chips offering an altered curve, though unlike on the Aprilia/Rotax system you had to actually swap the chip over rather than flick a switch to change them.

Surprisingly, though, Santi Mulero said they used the same design of cylinders and pipes for all types of circuits, and though two types of Keihin carburettors were available, Sito only raced at Laguna Seca with the newer kind.

With such a wide spread of power it did allow you to hold a gear between corners if you wished, like the last two right-handers before the pits at Calafat, thus saving two time-wasting gearshifts up and down again. The Honda engine's great advantage was not so much in terms of outright power, though, but in torque. You could short-shift at 11,000rpm where necessary or convenient – like on the last left sweeper before the line at Calafat, where Sito's favoured

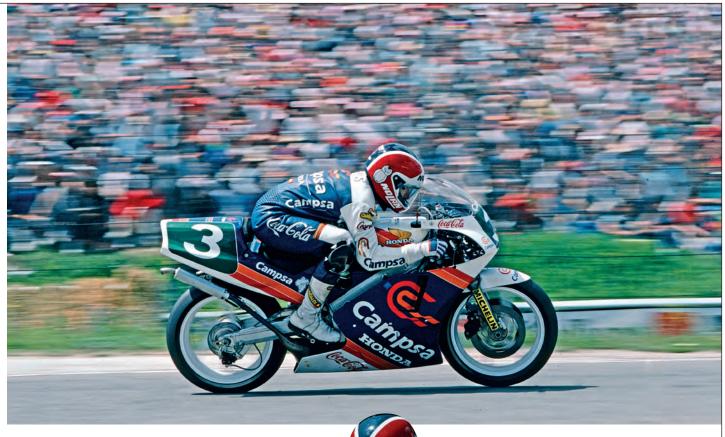
one-down/five-up left-foot gearshift made it hard to shift up from third to fourth while cranked hard over.

Solution: short-shift at eleven grand, crack the throttle wide open, and let the Honda's ultra-flat torque curve pull you through. Doing this in preference to buzzing the engine in third enabled me to get peak revs of 13,000 in fourth 80-100 metres earlier down the straight, and provided a lesson in how to ride this bike to best advantage. You must consciously use one gear higher than you might with a rotary-valve Rotax or Aprilia, taking corners in second rather than bottom gear, third gear rather than second, using the finely-honed suspension to keep up momentum, and trust the strong midrange torque to pull you out of the turn.

This flexibility makes the choice of gear ratios perhaps less critical than would otherwise be the case, but in any event the side-loading cassette-type cluster had a wide choice of options, ranging from five each for the bottom four gears, to seven each for the top two. Antonio Cobas' talents come into play again here, thanks to the computer programme he'd developed to enable his riders to select the optimum gearbox for each circuit and each set of conditions.

The Sito Pons 1989 world champion Honda NSR250 was that rare thing – a racebike that was above reproach for its era. After five years of development, it had become one of the all-time greats in racebike design, with four world titles to its credit out of five attempted. Just as well Yamaha didn't stop trying to turn the tables, which they did in 1990 courtesy of John Kocinski!





# SITO PONS: A career in racing

Born into a wealthy family in 1959 in what was already bike-mad Barcelona, the capital of the Spanish motorcycle industry, Alfonso "Sito" Pons combined studying to be an architect with cutting his teeth as an increasingly hardened street racer round the avenues of the Catalan capital and the hills surrounding it, first aboard an Ossa, then a series of Bultacos.

Above: Sito Pons winning the 1988 Spanish GP. DON MORLEY

> Sito waves to the crowd after winning the 1988 Belgium GP. Not a hair out of place. DON MORLEY

Inevitably, he began road racing, participating in the Criterium Solo Moto series for young riders where he distinguished himself in competition with other youngsters like Carlos Cardus and Aspar Martinez, before then stepping up to the Spanish 250cc Championship.

There he attracted the attention of Manolo Burillo, a motorcycling lawyer and team owner, who took a liking to him and offered him a place in his Siroko 250GP team, racing bikes designed by another young Catalan who would later make his mark on the motorcycle world, Antonio Cobas.

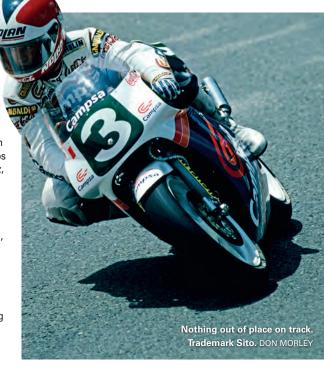
In his first season in GP racing in 1980 aboard the tube-frame Cobas-designed Siroko-Rotax tandem-twin, Pons distinguished himself by finishing seventh in the final race of the season,

> the Belgian GP run on the demanding Spa-Francorchamps circuit, and also finished second to Angel Nieto in the Spanish 250cc championship run predominantly on street circuits. In 1982 he switched to Antonio Cobas's new creation, the Kobas-Rotax, employing the world's first twin-spar aluminium chassis, and on this he gained his first GP podium finish with third place in Finland, and fourth in the next race at Brno. The

following season a serious injury forced him to sit on the sidelines for two months, ruining his season.

But in 1984, Sito returned to racing on top form aboard the ever more competitive Kobas, finishing third in the first race of the year in South Africa, before taking his first-ever GP race victory on home ground at Jarama, where he received the winner's laurels from his motorcycling monarch, King Juan Carlos.

A total of four podiums took Sito to fourth place in the final points table, a result which perhaps unfortunately attracted the attention of factory Suzuki team manager Roberto Gallina, whose riders Marco Lucchinelli and Franco Uncini had won the 500GP World Championship in 1981-82. For 1985 Gallina



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offered Sito a place in his factory Suzuki team, but in spite of top 10 finishes in his first three races, it proved to be a poor decision to accept it. A combination of difficulty in adapting his high-turn speed riding style to the 500 class as well as the Suzuki's declining competitiveness and reliability saw Sito's best result just seventh at Le Mans, but a series of crashes left him riding injured for a good part of the season.

So for 1986 Sito returned to the 250GP class, for which he managed to land a ride on a factory Honda NSR250 similar to the one on which Freddie Spencer had won the 250cc world title the previous season

It was a wise decision, and supported by Campsa, Spain's then largest petroleum company, Pons finished second in the world championship after a season-long battle with Carlos Lavado on the factory Yamaha YZR250, scoring eight podiums and two victories in Yugoslavia and - yes, Belgium to finish as top Honda rider. But the following year, he won just one race and was only third in the world series behind German riders Toni Mang and Reinhold Roth, both on Hondas similar to his own.

At 28 years of age, Sito Pons was now aware that time was running out for him to realise his ambition to become Spain's first 250cc world champion. But after finishing on the podium in the first two races of the year, he once again won the Spanish GP, this time at Jerez, the first of four victories in a season which saw him finish on the podium 11 times, en route to clinching the world title just 10 points ahead of Juan Garriga.

The careers of both of them would be intertwined for the next four years.

With his confidence boosted by this second world crown, Pons then decided to try again to make his mark in the 500GP class in 1990 with a Honda NSR500. But even with the help of Antonio Cobas, who had played a key role in his two world title victories, Sito found it hard to tame the fiery NSR, and could only finish tenth in the championship in 1990, and fourteenth in 1991.

At the end of that season he finally decided to retire to begin a new career as a team manager, first with the young Alex Criville as his rider, whom he saw as his successor. Over the next two decades Team Pons became a staple member of the GP paddock, and in due course Sito became President of the team's association IRTA.

Team Pons riders down the years have included Carlos Checa, Max Biaggi, Troy Bayliss, Alberto Puig, Loris Capirossi, and Alex Barros before he switched to the Moto2 series in which in 2013 Team Pons led Pol Espargaró to the title of Moto2 World Champion.

On the 30th anniversary this year of the first of his two world championships, Sito Pons shows no signs of wanting his long career in GP racing to end...

