

ICQCC 2011-Yokohama

1. Escape prevention of untightened components of test plug in AT assembly

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8. Abstract (approx. 400-500 words)

When it was discovered that transmissions with loose test plugs were being passed on from the automatic transmission assembly process to the next process, the K61 Circle maintenance team took on the issue. In the process, test plugs with sealant are temporarily fastened to the transmissions, which are placed seven at a time, and then tightened with fastening tools known as nut runners (with a torque of 6 Nm). Twenty-five transmissions with completely untightened plugs were passed on from the process during a five-day period, all at start of work or after the lunch break. We established the goal of completely eliminating the issue. In analyzing what was causing it, we hypothesized that there was an issue with the control system or that torque was being generated at some point in the equipment and investigated 10 potential causes. However, we found nothing. We then held another meeting and checked torque waveforms during tightening, finding that with untightened transmissions, torque was being generated in nearly zero seconds despite the fact that the nut runner was barely rotating. After thoroughly investigating the equipment, we were led to believe that the issue involved the test plug sealant. When we inquired as to the sealant's properties with the part manufacturer, we discovered that it was a MEC-processed product. MEC processing is a special type of treatment that combines compounds designed to prevent leakage and loosening by incorporating micro-capsules in the sealant that break down when twisted, releasing a locking agent that causes a locking reaction, and we suspected a relationship between that processing and the fact that the issue was occurring at the start of work and after the lunch break. When we investigated the relationship between time and torque, we found that torque reached 6 Nm after 40 minutes, leading us to conclude that the cause was that the sealant adhered over time. We determined that it would be difficult to change the type of sealant used and decided instead to make changes to the equipment being used so that it could identify transmissions on which the sealant had adhered. As a result of this examination of the issue, we conducted a trial using the two parameters of time and angle of rotation and succeeded in calculating a time and angle that would allow the equipment to identify the problematic transmissions. As a result, we were able to eliminate the issue, standardize the cause and its solution, and issue a sheet so that the solution could be applied in other workplaces. The process also led to improvements in such areas as young employees' diagnostic skills.

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フォーマットA

① AT組立におけるテストプラグ未締め付け品の流出防止

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⑧発表要旨 (800字以内)

ATの組立工程においてテストプラグの未締め付け品が後工程に流出。保全部隊のK61サークルが取り組むことになった。この工程はATにシール剤付きのテストプラグを仮締めの後、7台おいて締付装置のナットランナーで本締めする。(トルク6Nmで本締め終了)。未締め付け品は、まったく締まっていない状態で5日間で25台発生し、始業時や昼休み後に発生していた。目標を流出ゼロとし、取り組むこととした。要因解析では、制御系の不備または設備のどこかでトルクが発生していると仮説を立て10項目の推定要因を検証したが、どこにも問題はなかった。再度ミーティングを開き、締め付け時のトルク波形を確認することにした。すると未締め付け品はナットランナーがほとんど回転していないのにトルクがほぼゼロ秒で発生していることが分かった。設備側はほぼ調べつくしたことから、テストプラグのシール剤ではないかと思い至り、シール剤の性質を部品メーカーに問い合わせたところ、メック加工品であることが分かった。メック加工とは、ねじ込むことでシール剤の中のマイクロカプセルが破壊されロック剤がにじみ出て固着反応を起こす「洩れ防止」と「緩み防止」を一体化した特殊加工品であり、始業時や昼休み後での発生と関係がありそうである。経過時間とトルクの間隔を調べると40分後にはトルクは6Nmに達した。原因はシール剤が時間をおくと固着するためと分かった。対策は、シール剤変更困難との判断から設備側でシール剤固着品を判別することとした。検討結果、時間と回転角度の2つのパラメーターのトライアルを行い判別できる時間と角度を導き出すことに成功した。この結果、流出はゼロとなり、今回の要因と対策を標準化するとともに水平展開シートを発行した。若手の診断能力なども向上した。