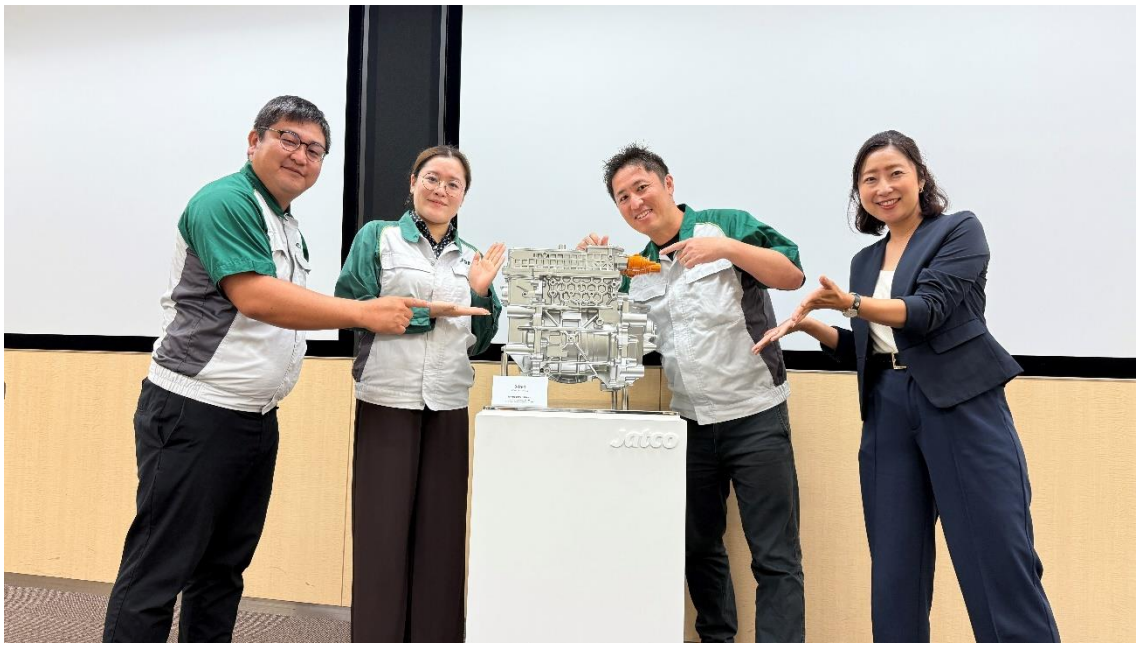
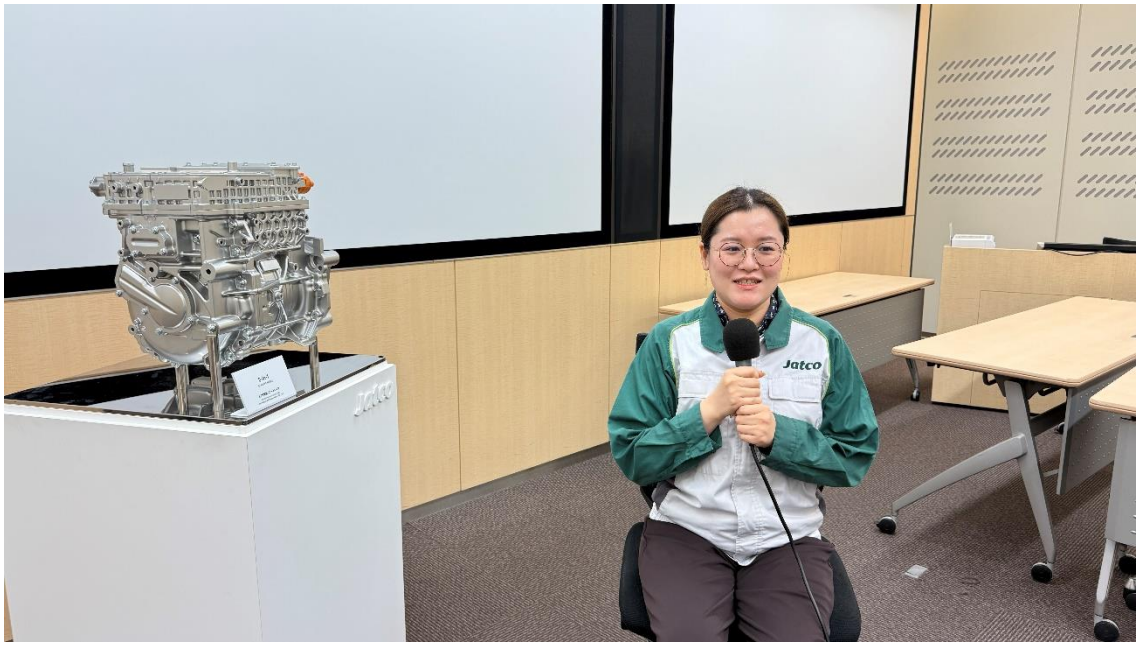
X-in-1 Debut! Exclusive Coverage with Key Personnel – Development Edition

The electric powertrain “X-in-1” began production in fiscal 2025. How was the X-in-1, which will support JATCO’s future electrification initiatives, developed?
At *My JATCO*, we will introduce the people involved in this highly anticipated new product over multiple features. In this edition, we spoke with the development team at the Technical Center (NTC) in Atsugi, Kanagawa Prefecture.



From left: Yoshizaki, Watanabe, Yoshizawa, and My JATCO Editor-in-Chief Yamada, smiling in front of the 3-in-1 model

Watanabe, Project Promotion Department



First, could you briefly explain X-in-1?

Until now, cars were powered by an engine and CVT. In this project, we changed the structure to use a new drive unit called X-in-1.

The unit for EVs is called 3-in-1, and the one for e-POWER is called 5-in-1. Collectively, these are referred to as X-in-1.

We integrated three or five functional components into a single unit. The 3-in-1 (for EVs) consists of a motor, an inverter that controls the motor, and a reduction gear. The 5-in-1 (for e-POWER) consists of a motor, inverter, reduction gear, generator, and speed increaser.

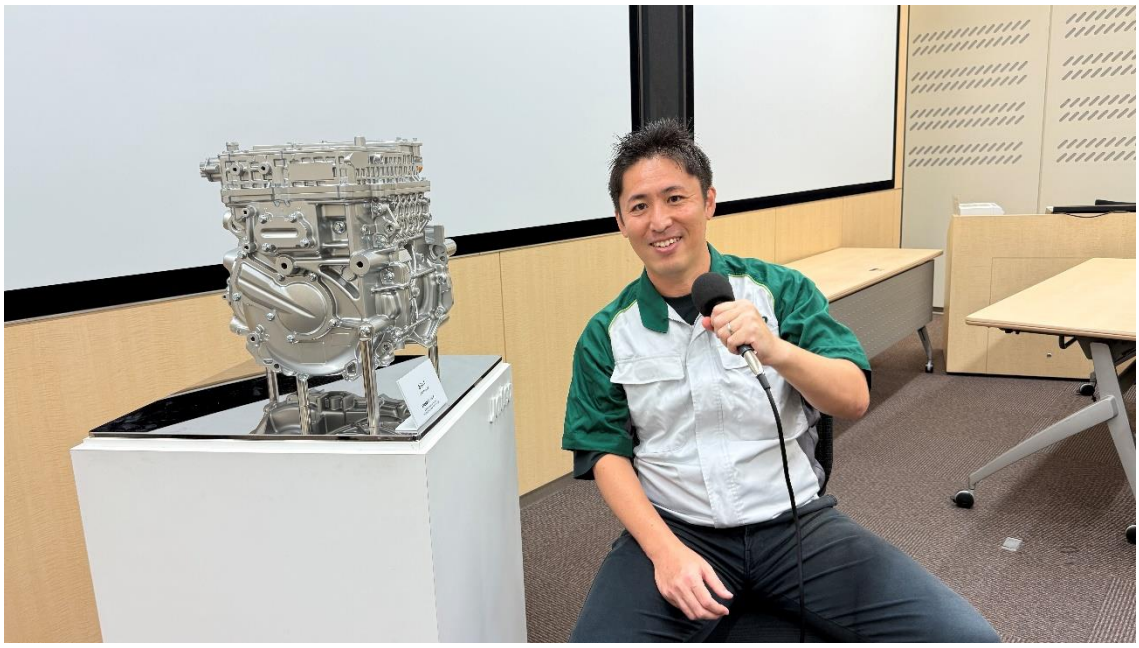
What did you gain from collaborating with Nissan Motor?

Personally, one major benefit of the joint development was learning and adopting the PDT (Product Development Team) activities*1 from Nissan.

The purpose of PDT activities is to clarify the cost of each component and organize a scenario to achieve targets. Previously, at JATCO, only unit-level prices were considered; component-level cost targets were unclear, and no structured actions were taken to meet targets. This made it take a long time to achieve cost goals. As a result, when it came time to finalize the mass-production specifications, we could not ensure that X-in-1's cost targets would be met. Without improvements, we risked losing cost competitiveness and product value compared to other companies. That is why we adopted this new approach from Nissan.

The most important aspect of PDT activities was visualizing the gap between current costs and benchmark costs. By doing this, we identified target components for cost reduction and focused on key points, which shortened the time needed to reach targets. Moving forward, our challenge is to enhance cost competitiveness by building on the strengths of past PDT activities and collaboratively achieving lower costs in a shorter period.

Yoshizawa, Project Promotion Department



This X-in-1 was developed through "group development"*2. Could you share the development concept and your initial thoughts?

The X-in-1 project aims to enhance competitiveness for next-generation e-POWER/EVs, with cost reduction through thorough component standardization as a key concept.

By creating an integrated structure, we eliminated unnecessary walls and supports, achieving a smaller and lighter unit. The integrated design also improves rigidity, enhancing quietness. Initially, there were only three of us, including myself and the section manager, and development started with a model that looked like a cartoon. I vividly remember thinking, "Will this really become a car?"

At that time, my main focus was planning how to conduct development verification for such a highly innovative structure. From past experience with post-production

defects, I wanted to minimize rework and conduct as many preemptive experiments as possible during the prototyping phase. While I couldn't accomplish everything perfectly, I feel that the 3-in-1, my main development project, was successfully developed, and personally, I would give this project a perfect score.

Do you have any memorable or rewarding experiences during development?

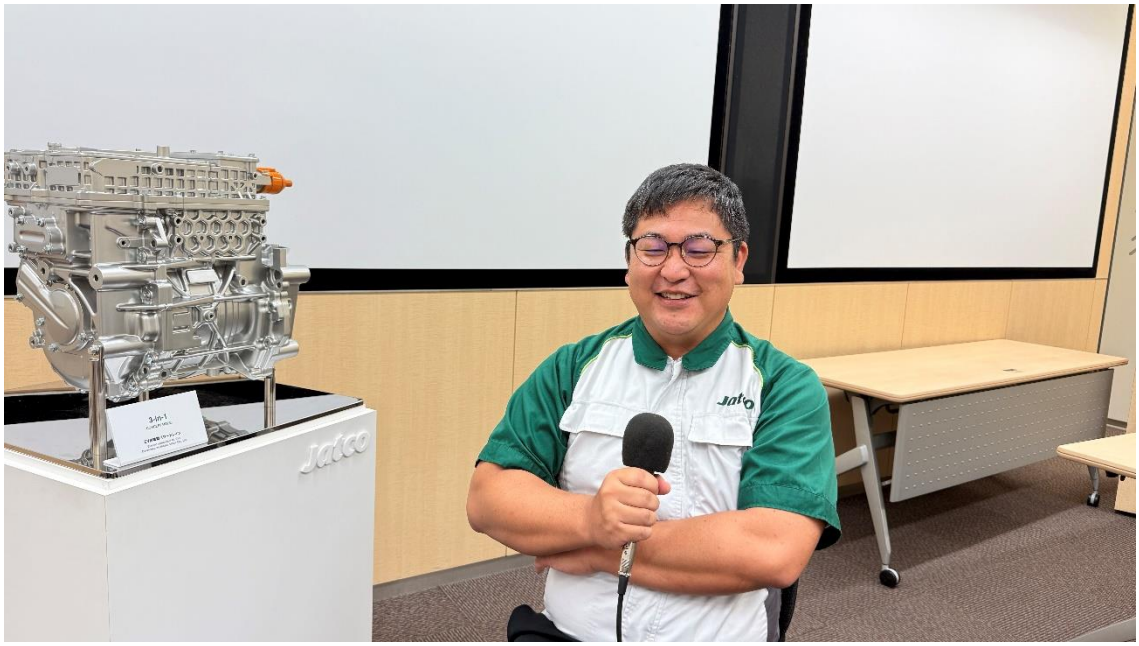
Definitely. Riding a car equipped with the X-in-1 unit in the PFC (Platform Confirmation) lot was the most memorable moment.

Just driving a car with our own designed product was thrilling, but additionally, experiencing firsthand how quiet and powerful the acceleration was made me feel that our team's hard work in development was truly worthwhile.

Any other examples?

Yes. Since our X-in-1 unit contains electrical components, it must not be damaged in a collision. It is placed in the area of the front-engine vehicle that experiences the most impact, making the design very challenging. We positioned protectors strategically to absorb shocks and incorporated special structures in areas subject to high collision forces during desk-based design. During an actual collision test, seeing the crumpled front initially made me think, "Oh no, this won't work." However, when our 3-in-1 unit was successfully removed from the vehicle with minimal damage, everyone felt immense relief.

Yoshizaki, Project Promotion Department



What were the difficulties or challenges in X-in-1 group development?

One challenge was horizontal deployment when defects occurred. In group development, both hardware and software are designed with a unified concept. If a defect arises in one project, the solution must be applied to other projects. Coordinating this requires careful planning of each project's schedule and defect implementation timing, which takes considerable effort.

For example, implementing a solution required not only agreement with superiors, but also preparation of development costs, timing agreement, parts procurement, and software updates for each project. Even small solutions required significant effort. The repro work in factories for software updates was especially demanding due to the high number of units needing updates. To meet shipping deadlines, we had to work in two shifts, including night shifts. The unfamiliar night work was physically and mentally taxing, but it was a valuable learning experience. Seeing that production runs day and night, I developed appreciation for post-development processes. I now try to carry out my work with consideration for the next process, aiming to reduce burdens on both development and production.

How will you apply this experience to future electrification development at JATCO?

Over the past year and a half, I gained hands-on experience in electrification development and had opportunities to practice entrepreneurial thinking through

competencies:

- Broaden perspectives, show interest in social issues, and explore them
- Question conventional wisdom and think thoroughly
- Embrace challenges without fear of failure and enjoy change

For example, I was involved in creating drawings for shipment testing. I encountered terms unique to electric vehicles, such as induced voltage, insulation resistance, and resolver phase angle, which were unheard of during the CVT era. I researched these terms and examined how they relate to unit operation and shipment assurance. I also visited production sites multiple times to understand actual parts and processes, deepening my understanding of EV structures and functions.

In CVT development, I relied on colleagues' knowledge and often didn't fully understand the drawings or equipment. In contrast, in this new field, I learned to thoroughly investigate and understand the work to make informed choices for the customer. My approach shifted to ensuring that I fully understood the product before proceeding, aiming to develop vehicles I would personally want to buy. Many others gained new experiences through EV development as well.

Despite the challenges, these experiences are valuable assets for JATCO as an independent company from Nissan. By sharing and practicing entrepreneurial thinking, we will continue to enhance JATCO's technical capabilities.

*1 Activities that manage and control cost fluctuations due to equipment changes until product launch, maintaining and improving activity targets to contribute to company performance.

*2 A development method where parts or systems common to multiple vehicle models or grades are planned, designed, and developed together as a "group."