

Zarif Sharifovich Tadjibaev, PhD

WORLD'S FIRST **IDEAL SEWING TECHNOLOGY** **ZARIF 2025**

BASED ON A ROTATING LOOPER

THE THREAD METHOD **OF JOINING MATERIALS**

This is not the past – it is the foundation
of the autonomous sewing industry of the future.



ZARIF 2025 PLATFORM

Ideal sewing technology **ZARIF 2025** + AI + Humanoid robots + Autonomous robotic carts.

Ph.D. (Engineering) ZARIF SHARIFOVICH TADJIBAEV

THE WORLD'S FIRST IDEAL SEWING TECHNOLOGY ZARIF 2025 BASED ON THE ROTARY LOOPER

THE THREAD METHOD OF JOINING MATERIALS

This is not the past — it is the foundation of the autonomous sewing factory of the future

ZARIF 2025 PLATFORM

 ZARIF 2025 Ideal Sewing Technology |  Humanoid Robots

 Artificial Intelligence |  Autonomous Robotic Trolleys

The foundation of the future automated sewing factory without personnel

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US Patent No. 6,095,069

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Tashkent, 2026

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ABOUT THIS BOOK

The volume before you is the second book in the series *ZARIF 2025 — The Platform for Autonomous Sewing Production*. It is the world's first comprehensive guide to the revolutionary ZARIF 2025 sewing technology, which resolves once and for all the 170-year-old problem of automating sewing production. It describes in detail how the rotary looper technology, invented by Dr Zarif Tadjibaev, eliminates the fundamental shortcomings of traditional sewing machines (types 301 and 401), making fully autonomous, unmanned garment production possible.

▲ PROJECT STATUS (2026)

- The ZARIF 2025 prototype has confirmed the viability of the technology.
- The industrial version is under development (concept complete).
- Commercialisation is planned for 2026–2035.

WHO IS THIS BOOK FOR?

- ✓ Engineers and technologists in the garment industry seeking solutions for the automation of production processes.
- ✓ Factory managers and production directors aiming to increase efficiency and reduce dependence on manual labour.
- ✓ Investors in industrial automation, robotics and artificial intelligence.
- ✓ AI and humanoid robot developers (Tesla, Figure AI, Boston Dynamics) interested in integration with sewing equipment.
- ✓ Digital transformation specialists seeking pathways to Industry 5.0.
- ✓ Students and lecturers at technical universities studying advanced technologies in the textile industry.

WHAT WILL YOU LEARN FROM THIS BOOK?

- ◆ The history of sewing thread — from animal sinew to modern carbon fibres and smart threads for e-textiles.
- ◆ Why threadless methods (ultrasonic welding, adhesives, laser) cannot fully replace the classical sewn seam.
- ◆ How hybrid technologies combine the strength of thread with the impermeability of welding.
- ◆ Why traditional sewing machines (types 301 and 401) are fundamentally incompatible with robots — a detailed analysis of 10 defects of type 301 and 4 flaws of type 401.
- ◆ How ZARIF 2025 technology eliminates all these shortcomings — the operating principles of the rotary looper, dual-rotation kinematics, Dry Head architecture and digital control.
- ◆ What machines can be developed and manufactured in the future based on ZARIF 2025 sewing technology — from industrial sewing machines to specialised automatic units.
- ◆ Three types of integration of humanoid robots with ZARIF 2025 machines — from simple loaders to full sewing automation.
- ◆ The economics of the future — how ZARIF 2025 reduces OPEX by 75%, increases OEE to 85%+ and delivers payback within 11.1 months.
- ◆ The commercialisation roadmap — from prototype to fully autonomous factories by 2035.
- ◆ Investment opportunities — how to become part of a market opportunity worth \$400–900 billion over 15 years.

HOW TO READ THIS BOOK

This book clearly and consistently distinguishes between two levels of information:

✓ ALREADY PROVEN BY THE ZARIF 2025 PROTOTYPE

These facts are confirmed by 5,000+ hours of testing on a working prototype:

- Viability of the single-direction stitch-formation principle.
- Speed of up to 5,000 stitches per minute on materials up to 8 mm thick.
- Wide Head architecture: material range 0.1–8 mm without adjustment.
- Zero skipped stitches, zero thread breaks, zero needle breakages.
- Premium aesthetics: the reverse side of the new double thread chain stitch (type 401) is visually identical to the lockstitch (type 301).

◆ ENGINEERING CONCEPT

These solutions are described as a realistic next stage:

- Automatic thread-trimming device (1:1 drawings complete; prototype not yet manufactured).
- 360° circular sewing mechanism (1:1 drawings complete; prototype not yet manufactured).
- Industrial version with Dry Head architecture (requires further development).
- Integration with humanoid robots (being tested on prototypes).

PREFACE BY THE AUTHOR

Dear readers,

I wish to begin this book with a personal admission. Thirty-one years ago, in 1994, I asked myself a question which, as it turned out, could transform the entire sewing industry. At the time I was a simple engineer in Tashkent, and the question was this:

"Is it possible to create a double thread chain stitch without an eye-looper?"

At the time I did not know that this question would mark the beginning of a journey that would lead to the creation of the world's first robot-native sewing technology — a technology capable of finally solving the problem that had eluded the entire industry for 170 years.

In 2000, I received US Patent No. 6,095,069 for a method of forming a double thread chain stitch using a rotary looper. That was only the beginning. Over the subsequent 25 years, I transformed it into the world's first ideal sewing technology: ZARIF 2025.

The year is 2025. The Tesla Optimus humanoid robot sorts small components on the factory floor. Figure 03 sorts parcels with 99.9% accuracy. Boston Dynamics Atlas performs extraordinarily complex acrobatic routines. Artificial intelligence writes code, diagnoses illnesses, and drives vehicles.

And yet — a typical sewing factory in 2025 looks exactly as it did in 1925. Rows of machines under bright lights. A woman sits at each one. Her hands guide the fabric, repeating the same movements a thousand times per shift. Every 15 to 20 minutes she stops to extract a tiny bobbin, insert a new one, and re-thread the machine. A mechanic with a screwdriver hurries past.

An engineer from 1850, transported to 2025, would be astonished by the Tesla automobile plant. In a sewing factory, he would say: *"I understand this factory. I recognise these machines. This is the technology of my era."*

Why is this? That is the question I have been asking myself for 31 years. And today I am ready to present the answer.

This book is not merely a technical description. It is an invitation to witness how the sewing industry is at last making the transition from the mechanical principles of the 19th century to the digital, autonomous ecosystem of Industry 5.0.

— *Zarif Tadjibaev, Tashkent, 2026*

INTRODUCTION

170 Years of Stagnation and the Birth of ZARIF 2025

The global textile and garment industry, valued at \$2.36 trillion in 2025, stands at a critical technological crossroads. The industry employs more than 75 million people, and yet 90% of all sewing operations are still performed manually or with minimal automation. Whilst automotive manufacturing, electronics and logistics have already transitioned to full or partial autonomy, the sewing shop floor has remained trapped in the technological paradigm of 1846.

The reason is not a lack of robots, nor any weakness of artificial intelligence. The reason lies in the sewing machine itself, whose architecture has not changed since Elias Howe invented the lockstitch. For 170 years, the industry has operated within the constraints of two fundamental technologies: the lockstitch (type 301)

and the double thread chain stitch (type 401). Despite annual revenues exceeding \$2 trillion worldwide, the industry was losing more than \$10 billion annually due to the inefficiencies, downtime and quality defects inherent in these obsolete systems.

Over the past 15 years (2010–2025), the global garment industry invested more than \$220 million in robotisation projects. Adidas closed its "Speedfactory" plants, spending more than €200 million. SoftWear Automation was unable to scale beyond simple T-shirts. Sewbo remained a laboratory curiosity. Every project foundered against the same barrier: the traditional sewing machine demands constant human intervention — to change the bobbin, adjust the tension, replace a broken needle, re-thread a snapped thread.

The gap is evident: robots are ready, AI is ready, but the tool — the sewing machine — is obsolete. It is precisely this gap that ZARIF 2025 technology addresses, having been designed from the outset as a robot-native device.

ZARIF 2025 sewing technology represents the first fundamental breakthrough in the mechanics of thread joining since the mid-19th century. At the heart of the technology is a rotary looper that makes two full rotations per needle cycle, eliminating the root causes of all key problems: the bobbin, the eye-looper, the "thread triangle" and critically small clearances. The result is a new type of double thread chain stitch that looks like a lockstitch, stretches like a chain stitch and outlasts both.

This book will guide you through 31 years of invention history — from the question posed in 1994 to the prototype that, in 2025, proved that ideal sewing technology is possible. And it is already here.

But before we immerse ourselves in the revolutionary aspects of ZARIF 2025, we must understand the very foundation of the entire sewing industry — thread itself. Without this understanding, it is impossible to appreciate the scale of the breakthrough that our technology offers.

PART I

THE HISTORY AND PRESENT STATE OF SEWING THREAD

CHAPTER 1. THE EVOLUTION OF SEWING THREAD

From Sinew to High-Tech Fibres: 36,000 Years of Innovation

1.1. Prehistoric Times: Thread as a Tool for Survival

The history of thread began long before the appearance of the first civilisations. The oldest textile fibres discovered by archaeologists date back 36,000 years BC — the Dzudzuana cave in Georgia yielded linen fibres indicating that, even then, people were able to process wild flax. During the Neolithic era, when our ancestors were grouping into tribes and mastering the hunting of large animals, a pressing need arose: how to protect oneself from the cold?

The very first "threads" were animal sinews, veins and intestines. They were strong, elastic and, most importantly, always close at hand. Sinews were split into thin fibres which, upon drying, became rigid yet retained remarkable strength. Needles were fashioned from bone or horn — carefully sharpened on stones. The process was laborious, but it made survival possible in the harsh conditions of the Ice Age.

Certain peoples of the North continue to this day to use reindeer sinew for sewing traditional clothing — Nenets craftswomen, for example, maintain that such thread serves longer than any synthetic material and does not abrade fur.