Zarif Sharifovich Tadjibaev, PhD

WORLD'S FIRST

IDEAL SEWING TECHNOLOGY

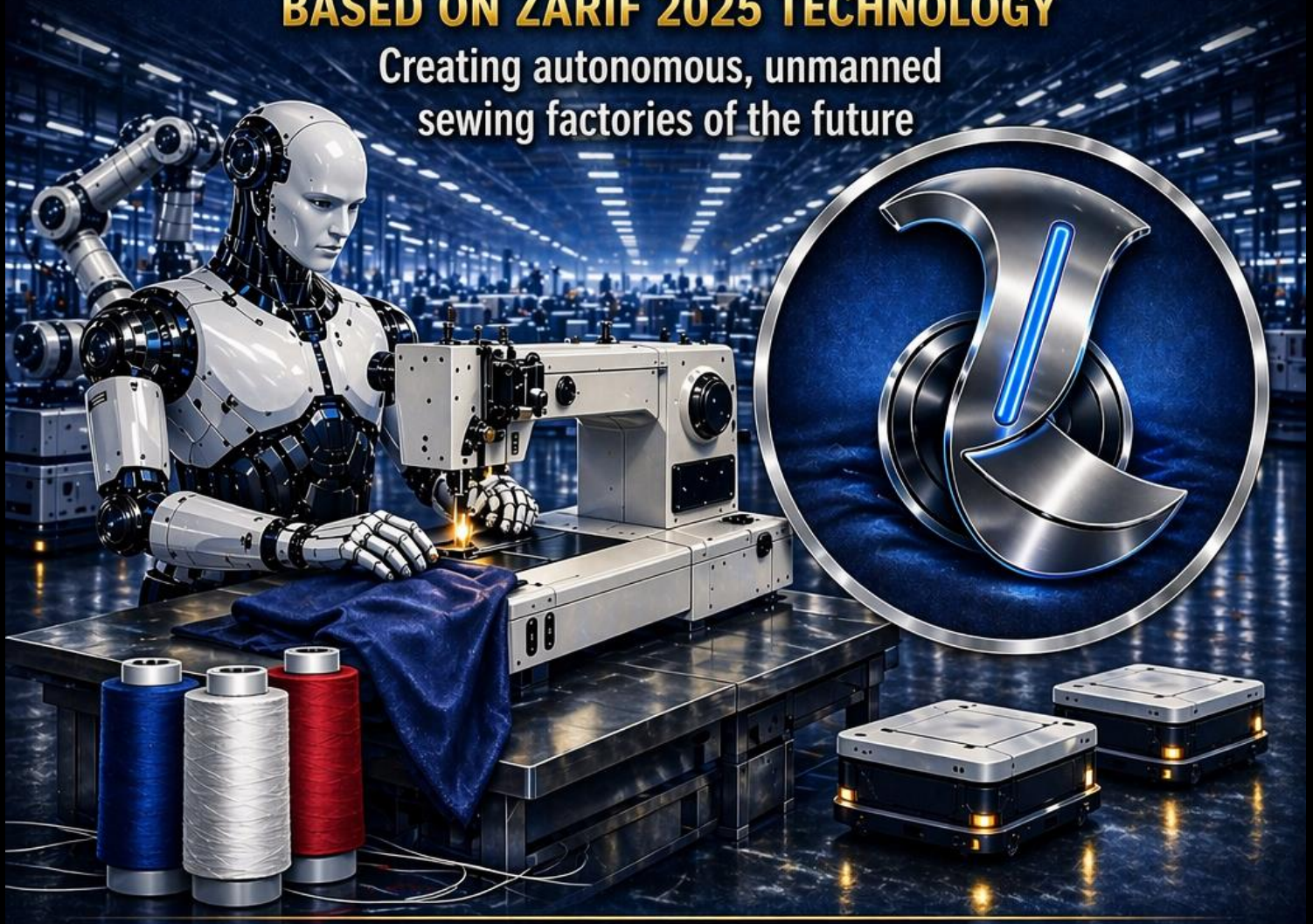
ZARIF 2025

BASED ON A ROTATING LOOPER

INTEGRATION OF HUMANOID ROBOTS WITH SEWING MACHINES AND AUTOMATIC MACHINES

BASED ON ZARIF 2025 TECHNOLOGY

Creating autonomous, unmanned
sewing factories 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

INTEGRATION OF HUMANOID ROBOTS WITH SEWING MACHINES AND AUTOMATS

Creating autonomous unmanned sewing factories 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

Zarif Sharifovich Tadjibaev

Candidate of Technical Sciences (Ph.D.), Inventor of the ZARIF 2025 Ideal Sewing Technology

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Tashkent, 2026

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ABOUT THIS BOOK

This is the fifth book in the ZARIF 2025 series. 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 sewing automation. 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.

The central theme of this book is the integration of humanoid robots with ZARIF 2025 machines. The author has developed three fundamentally different types of such integration — from the most complex (working with industrial machines) to the simplest (automated systems without templates). Each type has its own architecture, its own advantages, and its own technical requirements.

⚠ IMPORTANT NOTICE

At present, a prototype of the ZARIF 2025 sewing machine exists, which has practically confirmed the operability of the stitch-formation technology at speeds of up to 5,000 stitches per minute, even in a very poor technical condition.
Industrial machines, serial sewing automats, integrated humanoid robots, and a fully autonomous factory remain subjects of further engineering development.

WHO THIS BOOK IS FOR

- Mechanical engineers and technologists in the sewing industry seeking solutions for the automation of production processes
- Factory managers and production directors striving to improve 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
- OEM sewing equipment manufacturers
- Specialists in the digital transformation of manufacturing, seeking pathways to Industry 5.0
- Students and lecturers at technical universities studying advanced technologies in the textile and light industry

WHAT YOU WILL LEARN FROM THIS BOOK

- Why traditional sewing machines (Types 301 and 401) are incompatible with robots — a detailed analysis of 11 fundamental defects of the lockstitch and 8 irresolvable problems of the chain stitch.
- How ZARIF 2025 technology eliminates all these defects — the operating principles of the rotary looper and ten revolutionary breakthroughs.
- 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 in 11.1 months.
- The commercialisation roadmap — from prototype to fully autonomous factories by 2035.
- Investment opportunities — how to become part of a $400–900 billion market opportunity over 15 years.

HOW TO READ THIS BOOK

The book makes a fundamental distinction between two levels of information.

✓ ALREADY PROVED BY THE ZARIF 2025 PROTOTYPE

Operability of the single-direction stitch-formation principle
Sewing without skipped stitches, thread breakages, or needle breakages
Operation at speeds up to 5,000 stitches per minute
Sewing materials up to 8 mm thick with a needle bar stroke of 32 mm

Minimum stitch length of 0.5 mm
Compatibility with a standard single-groove needle

◈ ENGINEERING CONCEPT
Industrial version, digital control, automatic thread trimming
Circular sewing mechanism, interfaces for humanoid robots
Autonomous robotic trolleys and the full-scale ZARIF Autonomous Factory
These solutions are described as a realistic next stage, based on existing components, materials, and digital technologies.

PREFACE BY THE AUTHOR

Dear Reader,

In 1994, I posed a question that changed my life: "Is it possible to create a double thread chain stitch without an Eye-Looper?" Most of my colleagues considered the question naïve. Twenty-eight years later, the ZARIF 2025 prototype sews materials ranging from the finest silk to an 8 mm pack of leather without a single missed stitch — despite the very poor technical condition of the worn prototype.

This book is devoted to its central theme: the integration of humanoid robots with ZARIF 2025 machines. I have developed three fundamentally different types of such integration — from the most complex (working with industrial machines) to the simplest (automated systems without templates). Each type has its own architecture, its own advantages, and its own technical requirements.

In addition, this book describes two of my key inventions from 2020–2025: the automatic thread-trimming technology, and the 360° circular sewing mechanism without rotation of the head. Both inventions currently exist in the form of theoretically confirmed drawings. Their practical verification is the next step on the path to industrial machines.

The prototype has proved the most important thing: ZARIF 2025 technology works. Everything else is merely a matter of time, engineering effort, and investment. Welcome to the ZARIF 2025 Factory of the Future.

— **Ph.D. Zarif Tadjibaev**, Tashkent, 2026

INTRODUCTION

THREE INCOMPATIBLE THINGS THAT ARE NOW COMPATIBLE

For more than 170 years, the sewing industry has employed the same fundamental stitch-formation principles. Robotics has travelled the path from science fiction to industrial reality. Artificial intelligence is transforming entire industries. Yet three things had never been brought together: ideal sewing technology + humanoid robot + industrial autonomy.

In the world of the sewing industry, three things had until recently been considered fundamentally incompatible: humanoid robots — capable of complex manipulation, yet unable to work with traditional sewing machines; autonomous production — a factory without personnel, operating 24/7, yet impossible owing to the necessity of constant human intervention in the sewing process; and ideal sewing technology

— without stitch skipping, without bobbins, with digital control of both threads, but which did not exist in nature.

ZARIF 2025 is the first technology in the world to have made these three things compatible. Not theoretically. Not "some day". Right now — in the form of a proven prototype, thoroughly developed concepts, and a concrete implementation roadmap for the period 2026–2030.

When working with traditional machines (Type 301 or 401), a robot is compelled to resolve 5–7 problems arising from the machine's own imperfections. With ZARIF 2025 — only one: guiding the material. Everything else is taken care of by the machine.

Integration Type	Equipment	Characteristic
Type 1	Industrial sewing machines	Most complex — the robot participates directly in the sewing process
Type 2	Pattern sewing automats	Moderate complexity — the robot services the automat
Type 3	Automated systems	Simplest — the robot only loads/unloads

PART I

THE DIAGNOSIS: WHY TRADITIONAL SEWING IS INCOMPATIBLE WITH AUTONOMY

CHAPTER 1. AN ENCOUNTER WITH REALITY: WHAT TRADITIONAL SEWING TECHNOLOGIES CANNOT DO

The lockstitch (Type 301) and the double thread chain stitch (Type 401) — why both technologies have reached a dead end

Before immersing ourselves in the world of the new technology, let us take an honest look at the current state of the sewing industry. For nearly two centuries, its arsenal has consisted of two principal tools: the lockstitch (Type 301) and the double thread chain stitch with an Eye-Looper (Type 401). They have become so familiar that their shortcomings are perceived as an inevitable price of quality — as laws of nature. But are they laws?

1.1. The Lockstitch (Type 301): A King with the "Bobbin Curse"

The lockstitch is, without exaggeration, the industry's workhorse. More than 80% of all seams on your clothing, footwear, and bags are produced by this method. Its principal virtue is its non-ravelling nature. The interlooping of two threads occurs inside the material, and if a thread breaks somewhere, the seam will not "run" further. Moreover, a correctly adjusted lockstitch looks equally neat on both sides.

But this reliability comes at a price. And that price is the bobbin.

1.1.1. Limited Bottom Thread Reserve — A Systemic Brake

A standard industrial bobbin holds between 60 and 110 metres of thread. At a speed of 4,000–5,000 stitches per minute, this lasts only 12–20 minutes of continuous operation. Over an eight-hour shift, an operator is compelled to stop the machine 30–50 times solely to change the bobbin. Each stoppage takes 30–45 seconds. Total time losses on a single machine amount to 20–35 minutes per shift.