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CONTROL THE QUALITY OF PRODUCTS MANUFACTURED AT THE ENTERPRISE BY ASSESSING THE UNCERTAINTY OF MEASUREMENTS

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Abstract : Measurement of the results uncertainty in evaluation A and B kind of components clear separation and correct calculation necessary. A type statistic basically experimental stability shows , B type working issuer specification and calibration to the documents based without Their combination through general expanded uncertainty is determined , this and measurement result reliability level determines . Quality under control this approach decision acceptance in doing important material evidence as service does .

Key words : measurement , object , parameter , standard , industry , product , technological .

The first stage of metrologically based product quality assessment is the identification of the research object and the selection of its main quality indicators. This section describes the target object of the study, the technological process of the product, the important parameters of measurement, as well as the tools and standards selected to ensure the accuracy of measurements.

, synthetic fiber yarn produced at a light industry enterprise was selected as the object of research . This product, due to its physical and mechanical properties, technological subtleties, and export orientation, places high demands on measurement reliability.

Also, the main technological stages in the production of this type of product are as follows (Table 1).

Table 1

Technological process of synthetic fiber yarn production

No.	Process step	Basic moves/equipment	Purpose
1	**Raw material preparation**	Receiving and drying of polymer granules	Moisture loss, obtaining a quality solution
2	**Melting (Extrusion Start)**	Melting in an extruder	Liquidizing polymer granules
3	**Filtration and homogenization**	Metal filters, mixers	Solution one kind and without impurities to the point to bring
4	**Spinneret extrusion**	Extrusion through spinneret plates	Formation of fine filaments

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5	**Cooling**	Air refrigerators or juicy bathtubs	Filament hardening
6	**Orientation**	Stretching rollers, heat treatment	Orienting molecules, increasing strength
7	**Surface treatment**	Emulsion sprayers , oil burners stations	Friction reduce , next again to work preparation
8	**Assembly (Winding)**	Coil winding machines	Ready the threads easy transportation and use for formation
9	**Heat treatment (if necessary)**	Texturizing machines (False-twist, Air-jet)	To give elasticity, appearance, or twisting properties
10	**Quality control**	Microscope, tensiometer, analyzers	Interruption strength , fibers number , one diversity , diameter , elasticity check
11	**Packaging and storage**	Automatic packaging machines, special warehouse	Dust and from moisture protection , transportation ready to the situation to bring

This stages every in one product to the quality directly or indirectly effect provider of parameters accuracy and them measurement of tools uncertainty research in the center stands .

Product quality descriptive main measurement parameters

Research within test and measurement works following main parameters according to take (Table 3.2).

Table 2

No.	**Parameter name**	**Unit of measurement**	**Description**
1	Linear density	tex	How many grams of substance are in 9000 meters of fiber?
2	Length	meter	Total length of the wrapped yarn
3	Diameter	mmm	Thickness of the fiber by cross section

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4	Breakdown force	N	Fiber in the stretch interruption in the phase power
5	Humidity ratio	%	Dried on the thread residue humidity amount
6	Roll mass	kg	Total weight of each yarn roll

Each of these parameters is a key indicator in determining a product's compliance with international export standards (e.g. ISO 2060, ISO 13934, ASTM D1907).

Table 3

Measurement tools used in the study

No.	**Measuring tool**	**Model / Type**	**Measurement range**	**Accuracy level**	**Calibration status**
1	Electronic scales	Radwag AS220.R2	0–220 g	±0.1 mg	Calibrated, 2024
2	Micrometer	Mitutoyo IP65	0–25 mm	±0.001 mm	Calibrated, 2024
3	Length ruler	Computerized wrapping system	0–1000 m	±0.01 m	Calibrated, 2024
4	Strength testing machine	Instron 3345	0–5 kN	±0.5% FS	Calibrated, 2024
5	Moisture Analyzer	Ohaus MB45	0–100% RH	±0.1%	Calibrated, 2024

These instruments are calibrated by local metrology centers (e.g., UzMMI) and each of them has a calibration certificate.

Table 4

Sources of measurement uncertainty in synthetic fiber yarn production

No.	**Process step**	**Measurement object**	**Sources of uncertainty**

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1	Raw material preparation	Polymer granules mass, moisture	- Scales Accuracy - Humidity ruler Calibration - Operator mistakes
2	Melting	Temperature (°C), pressure (bar), flow rate	- Thermosensor (thermocouple) accuracy - Extruder pressure sensor errors
3	Filtration and homogenization	Viscosity, temperature	- Viscometer Uncertainty - Temperature uneven distribution
4	Spinneret extrusion	Hole diameter , flow one diversity	- Spinneret hole performance - Temperature and pressure fluctuations
5	Cooling	Cooling temperature, air/water flow rate	- Accuracy in sensor calculations - Instability in flow rate measurement
6	Stretching	Stretching coefficient (relative length), speed	- Roller rotation speed - O ' measurement in place slip
7	Surface treatment	Sprayed liquid volume, viscosity	- Dosing machine in the system malfunctions - In equilibrium temperature and pressure
8	Assembly	Yarn length, density (tex, den)	- Thread continuity - Measuring wheel diameter accuracy
9	Heat treatment	Temperature, time, number of turns	- Temperature sensor uncertainty - Time determinant timers calibration
10	Quality control	Tensile strength, fiber diameter, elasticity	- Strain gauge calibration - Microscope accuracy - Subjective assessment differences
11	Packaging and storage	Packing weight, humidity, temperature	- Weight sensor errors - Microclimate variability in the warehouse

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Note:

-Measurement accuracy at each stage is increased through **calibration, conformity assessment, and regular maintenance .**

-In particular, **temperature, pressure and time measurements** are important factors for maintaining technological quality.

Table 5

Measuring tools in synthetic fiber yarn production

No.	Process step	Measurement object	Applied measuring instruments
1	Raw material preparation	Granule mass, moisture	- Electronic scales - Infrared moisture analyzer (IR Moisture Analyzer)
2	Melting	Temperature, pressure, flow	- Thermocouple or RTD sensor - Pressure sensors (manometers) - Flow flow meter meter)
3	Filtration and homogenization	Temperature, viscosity	- Temperature sensor - Digital viscometer (Brookfieldtype)
4	Spinneret extrusion	Filament output speed, spinneret holes	- Micrometers - Laser diameter gauges - Flow control regulators
5	Cooling	Air / water temperature , current speed	- Water temperature sensors - Anemometers (air flow for) - Water stream meters
6	Stretching	Elongation coefficient, speed	- Circulation roller speed sensor - Tachometers - LVDT (Linear change sensors)
7	Surface treatment	Emulsion amount, viscosity	- Drop Dispensers - Digital Viscometers - Sensor sprayer systems

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8	Assembly	Thread length, mass, smoothness	- Meterage Measuring tapes - Thread weight sensors - Workshop integrated sensitive wheels
9	Heat treatment	Temperature, time, number of turns	- Programmable temperature controller (PTC) - Timer - Torque sensors
10	Quality control	Breaking strength, diameter, elasticity	- Universal Testing Machine (UTM) - Microscope or laser micrometer - Elasticity testers
11	Packaging and storage	Package weight, storage temperature and humidity	- Platform scales - Thermo-hygrometers - Data loggers

Additional recommendations:

-There must be calibration documents (certificates) for each measuring instrument and they must meet the applicable ISO 10012 or ISO/IEC 17025 requirements.

-In particular, instruments measuring mass, temperature, and length should be regularly inspected as the main objects of metrological control.

The main quality indicators of the synthetic yarn product selected as the object of research - mass, linear density, length, diameter, breaking strength and moisture - characterize the technological quality of the product and its compliance with international requirements. The accuracy of these parameters, the uncertainty of the measurement results, the traceability chain and the condition of the measuring instruments ensure the metrological validity of the research. In the future, it is advisable to determine the uncertainties, calculate the total expanded uncertainty and develop a quality control mechanism based on these parameters.

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