Polymer Add (Thailand) Co.,Ltd.
Office - 106, Chalaremprakiat, Lor 9, Soi 22, Yak 5, Nongbon, Prawet, Bangkok, Thailand 10250
Factory - 188/3, Moo 8, Tambon Bangpu Mai, Amphoe Muang Samut Prakan, Samutprakan, Thailand 10280
Mobile - Thai : 0804531391, English: 0839415475, **E-mail –** contact@polymeradd.co.th

MICRONISED TALC IN POLYPROPYLENE (PP) PIPE APPLICATIONS

POLYMER ADD

Performance Role, Inherent Strengths, and Practical Specification Requirements

Polypropylene (PP) is widely used in pressure and non-pressure piping systems for drinking water, hot-water distribution, sewage, and industrial fluid transport. To meet long-term mechanical and thermal performance requirements, PP pipe compounds commonly rely on **micronised talc** as a functional mineral additive.

In PP pipes, micronised talc acts both as a **heterogeneous nucleating agent** and as a **reinforcing filler**, contributing to stiffness, dimensional stability, and controlled crystallisation during extrusion.

Role of Micronised Talc in PP Pipe Systems

During cooling from the melt, polypropylene crystallises around nucleation sites. Micronised talc provides stable, solid surfaces that promote crystallisation at higher temperatures compared to unfilled PP. This controlled crystallisation improves processing stability and supports long-term mechanical performance under pressure and elevated temperatures.

Inherent Strengths of Micronised Talc in PP Pipes

Micronised talc offers several material characteristics that are particularly suited to PP pipe formulations:

1. Stiffness and Creep Resistance
The lamellar structure of talc increases the elastic modulus of PP, improving resistance to deformation and long-term creep under continuous load.

2. Thermal Performance
Talc has higher thermal conductivity than polypropylene, enabling more efficient heat transfer during extrusion and cooling. This contributes to improved dimensional stability, especially in hot-water pipe applications.

3. Crystallisation Control
At moderate loading levels, improvements in rigidity and impact performance are largely linked to increased crystallinity rather than mechanical reinforcement alone.

4. Chemical Inertness
Talc is water-repellent, chemically inert, and stable in contact with drinking water and aggressive media, making it suitable for potable and sewage pipe systems.

5. Cost and Processing Robustness
Micronised talc provides a combination of nucleation, reinforcement, and cost efficiency that is difficult to replicate with low-dosage specialty nucleators alone.

Typical Specification Requirements for PP Pipe-Grade Micronised Talc

To function effectively in PP pipe compounds, talc must meet specific physical and purity criteria. Not all talc grades are suitable for pipe applications.

Particle Size & Morphology (Critical Parameters)

Parameter	Typical Requirement	Importance
Median Particle Size (D50)	1.5 – 3.5 µm	Ensures effective nucleation and stiffness
Coarse Fraction (D90)	≤ 10 – 12 µm	Prevents surface defects and stress points
Particle Shape	Lamellar / platy	Contributes to modulus and creep resistance
Agglomerates	Minimal	Ensures uniform dispersion

Chemical & Physical Quality Requirements

Property	Typical Requirement
Whiteness / Colour	High, neutral white
Moisture Content	≤ 0.5 %
Bulk Density (loose or compacted)	Application-dependent
Chemical Inertness	No reactivity with PP
Water Absorption	Negligible

Purity & Safety Considerations

Parameter	Typical Expectation
Heavy Metals	Low, within regulatory limits
Asbestos	Not present
Odour / Taste Transfer	None
Suitability for Potable Water Contact	Required where applicable

Typical Use Levels in PP Pipe Compounds

Micronised talc is commonly used at **5–40 wt%**, depending on:

- Pipe pressure rating
- Wall thickness
- Required stiffness and creep performance
- Presence of impact modifiers or secondary fillers

Talc is often combined with elastomers, antioxidants, coupling agents, and other additives to balance stiffness, toughness, and long-term durability.

Competitive and Complementary Nucleating Approaches

Low-dosage organic or inorganic nucleating agents can accelerate crystallisation at very small addition levels. However, these additives do not provide reinforcement or creep resistance. In PP pipe systems, they are typically used in combination with talc, not as direct replacements.

POLYMER ADD

Micronised talc remains uniquely positioned because it contributes structural support and nucleation simultaneously, which is critical for pressure-bearing applications.

In PP pipe compounds, micronised talc most commonly competes with (or is partially substituted by) the following nucleating + stiffness solutions:

1) MINERAL (NATURALLY OCCURRING) FILLERS / NUCLEATORS

- **Calcium carbonate ($CaCO_3$)** (GCC/PCC): cost-driven stiffness; often needs higher loading than talc for similar modulus; limited nucleation effect compared to platy talc.
- **Wollastonite ($CaSiO_3$)**: higher stiffness and HDT potential; more abrasive and typically higher cost than talc.
- **Kaolin / calcined clay**: stiffness and heat resistance; can increase abrasion and can impact colour.
- **Mica**: strong reinforcement due to platy morphology; higher cost and can reduce impact at high loadings.

Date of creation : Dec 2025

Date of Review : Dec 2027

POLYMER ADD