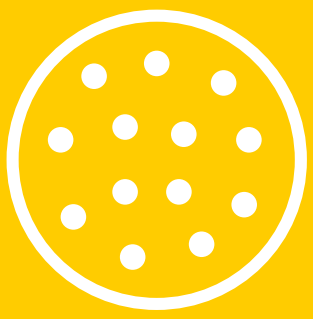
VOELPKER | plastic series

TECHNICAL STUDY

Friction reduction



Improved dispersion

Reduced costs

Flow improvement

CEVO® 3105: EFFECTIVE FRICTION CONTROL IN PA 6

Introduction

High frictional temperatures during rolling-sliding motion can alter the polymer structure and even lead to the rupture of bonds in polymer chains. High friction can also lead to other effects such as wear, heat generation, and surface damage. Proper friction control ensures that polymer chains and also sensitive additives can withstand mechanical stresses and maintain their integrity over time. The montan wax based formulation CEVO® 3105 has been rheologically tested in the present study in comparison to the standard montanic ester WARADUR® OP and Calcium stearate

Results
Test conditions and material

Test material
Aquamid AQ P 27000 PA6 for injection molding (Aquafil) Moisture content at delivery: 0,06 %
CEVO® 3105 (VOELPKER)
WARADUR ® OP (VOELPKER)
Calcium stearate S (Faci S.p.A.)

Test equipment
HAAKE™ Rheomix Lab Mixer / HAAKE™ PolyLab™ OS System torque rheometer platform[1] Filling quantity: 250 g Rheomix settings: When starting immediately after filling, the technically maximum permissible torque of the kneading machine was exceeded. A ramp was therefore set: 2 min at 220 °C without rotating the rotor to melt and compact the granules - 4 min kneading time at 220 °C with a speed of 50 rpm.

	Formulations
A	100 % Aquamid AQP 2700
B	99,5 % Aquamid AQP 2700 + 0,5 % Ca stearate
C	99,5 % Aquamid AQP 2700 + 0,5 % WARADUR® OP
D	99,5 % Aquamid AQP 2700 + 0,5 % CEVO® 3105

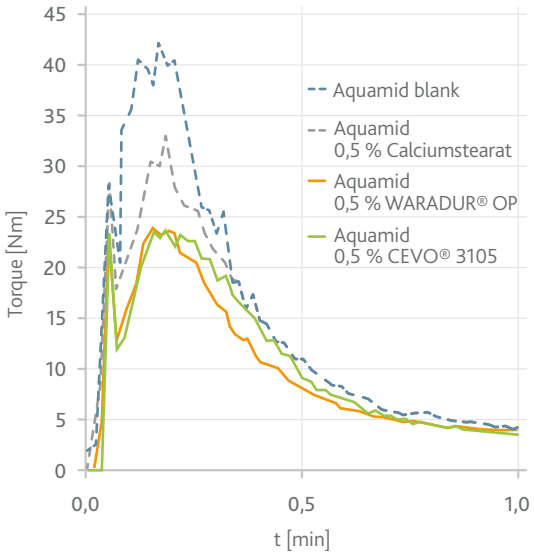


Table 1: Comparison of maximum torque force

[1] https://amslabo.com/product/haake-rheomix-os-lab-mixers-for-the-haake-polylab-os-system

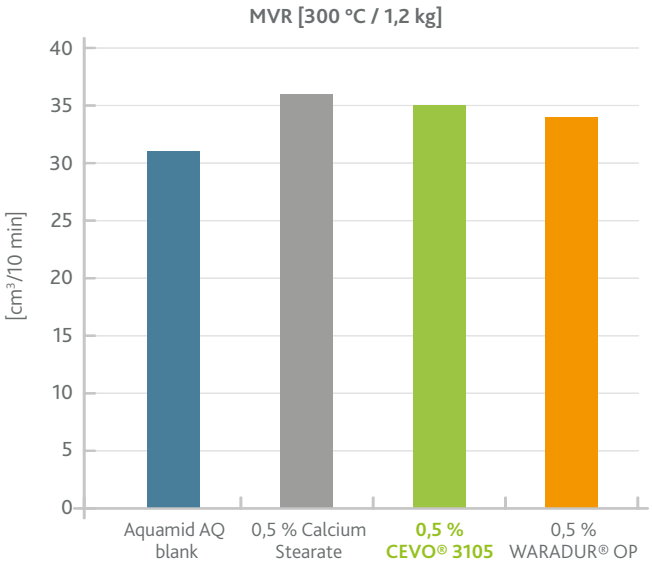


Table 2: Melt volume rate

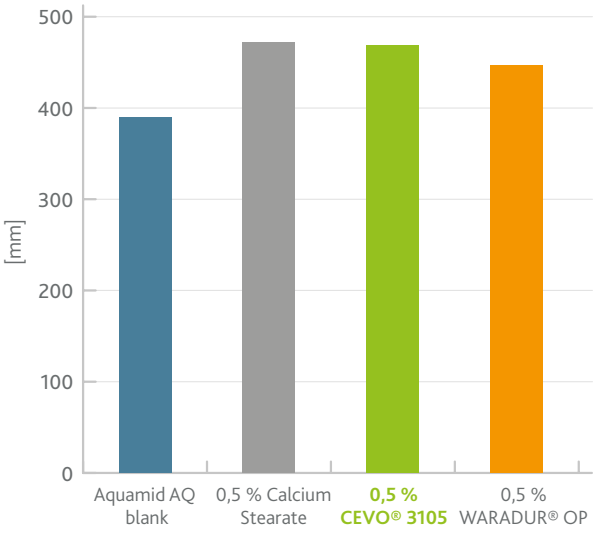


Table 3: Flowspiral lengths

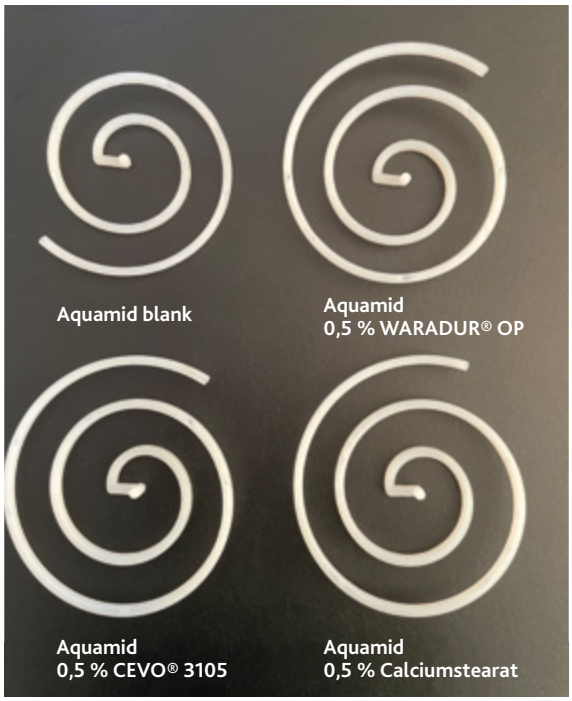


Table 4: Flowspirals

Summary and conclusion

CEVO® 3105 reduces friction peaks with the same effectiveness as WARADUR® OP:
Compared to unmodified polyamide (42 Nm), the torque values decreases below 25 Nm. CEVO® 3105 thus significantly reduces the shear forces that occur during compounding (Table 1).

As expected, intrinsic viscosity measurements indicated that also the polymer chain integrity was not affected. Calcium stearate, however, does not perform as an effective friction reducer (> 30 Nm).

CEVO® 3105 is also effective as flow improver for PA.
The melt volume rate for the compound with CEVO® 3105 is very similar to the values with WARADUR® OP or Calcium stearate (Table 2). The flow spiral experiment demonstrates that the use CEVO® 3105 results in an equivalent flow length as with Calcium stearate (Table 3 and 4).

In summary, CEVO 3105 combines synergistically various desired effects in polyamide processing at an attractive price.

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