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Start-up and operation of an aerobic granular sludge system under low working temperature inoculated with cold-adapted activated sludge from Finland

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1 Start-up and operation of an aerobic granular sludge 2 system under low working temperature inoculated with 3 cold-adapted activated sludge from Finland

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13 Abstract

14 An aerobic granular sludge system has been started-up and operated at 7 °C temperature
15 using cold-adapted activated sludge as inoculum. The system could form granular biomass due
16 to batch operation allowing for just 5-3 minutes of biomass sedimentation. Scanning electron
17 microscopy showed that fungi helped in the granular biomass formation in the early stages of
18 the granule formation. The removal performance of the system was of 92-95% in BOD₅, 75-
19 80% in COD, 70-76% in total nitrogen and 50-60% in total phosphorous. The bacterial
20 community structure from cold-adapted activated sludge changed during the operational time,
21 leading to a final configuration dominated by Microbacteriaceae members *Microbacterium*
22 and *Leucobacter*, which were strongly correlated to biomass settling velocity and bioreactor
23 performance, as suggested by multivariate redundancy analyses. This experiment showed that
24 aerobic granular sludge systems could be successfully started-up and operated, with high
25 performance, under low operational temperatures when using cold-adapted biomass as
26 inoculum.

27 Keywords: aerobic granular sludge; cold-adapted sludge; bacterial community dynamics;
28 granulation; low temperature; wastewater treatment

29 30 31 32 33 34 35 36 37 1. Introduction

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