



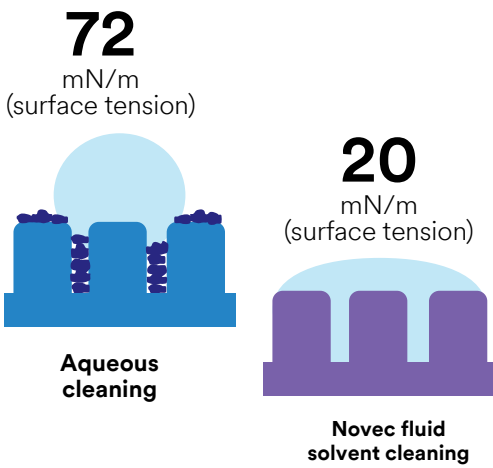
**Novec**<sup>TM</sup>  
Brand

# Don't tap into water's hidden costs

## Benefits of Vapour Degreasing with 3M<sup>TM</sup> Novec<sup>TM</sup> Engineered Fluids vs. Aqueous

High performance solvent cleaning technology using 3M Novec Fluids helps you overcome the higher total costs of aqueous cleaning – while maintaining your commitment to worker health and safety, environmental responsibility and product quality! Here's how:

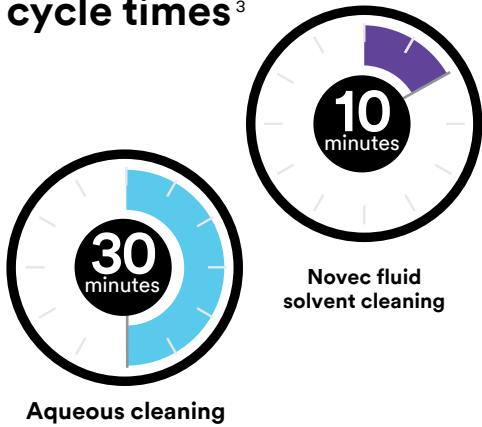
### Better penetration of tight spaces<sup>1</sup>



### Zero residue<sup>2</sup>

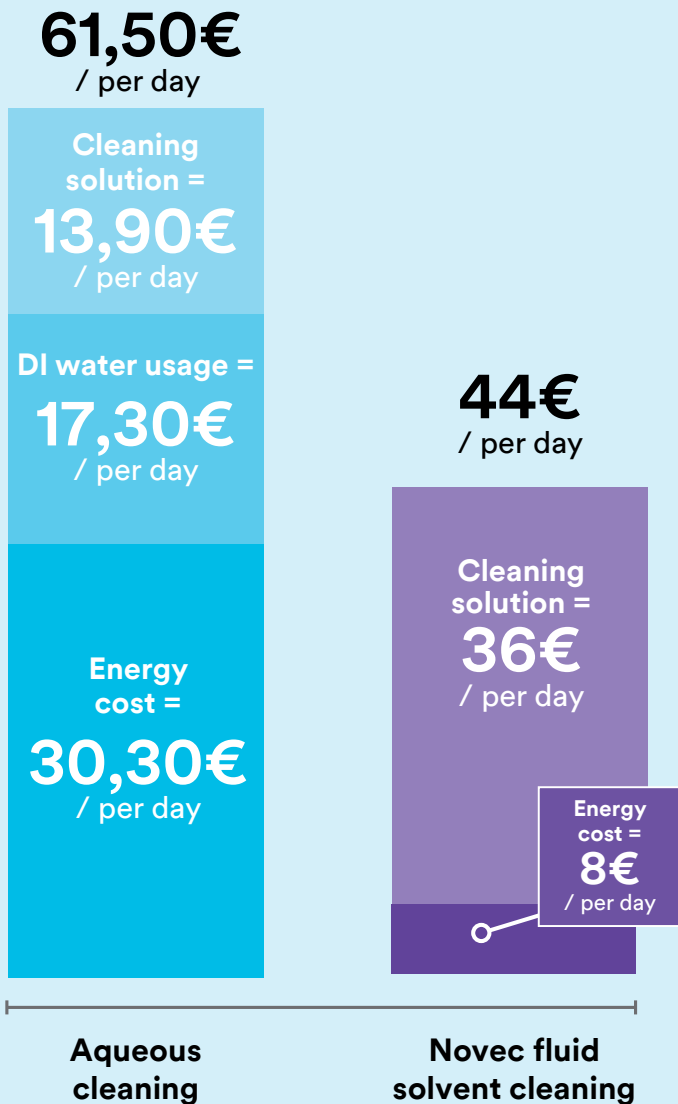


### Shorter cycle times<sup>3</sup>



### Cost saving of about 30% when using 3M Novec Fluids compared to Aqueous cleaning.

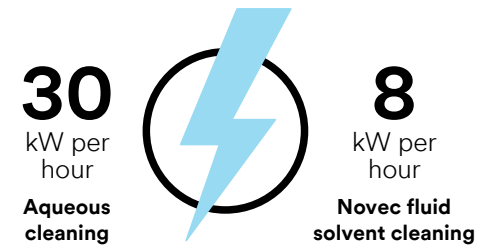
#### Consumables cost / per day<sup>4,5,6</sup>



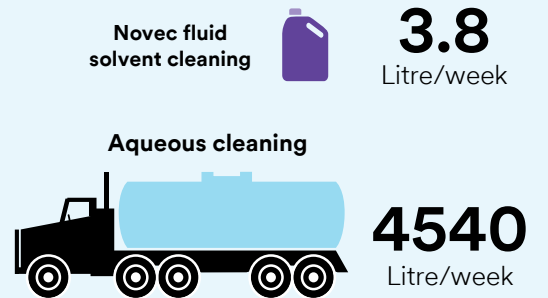
- Novec fluid is ready to use as delivered – incoming water requires a water treatment system
- Water and oil don't mix, but Novec fluid is engineered to dissolve common greases and oils used in manufacturing

\*Not for specification purposes. Results may vary. These results are typical based on batch cleaning processes with the same sump dimensions (30.48 cm x 40.64 cm x 30.48 cm) for a non-closed loop aqueous system vs. a solvent vapour degreaser cleaning system. To dive in deeper on the numbers, refer to the footnotes on the back or contact our technical experts.

### Less energy usage<sup>5</sup>

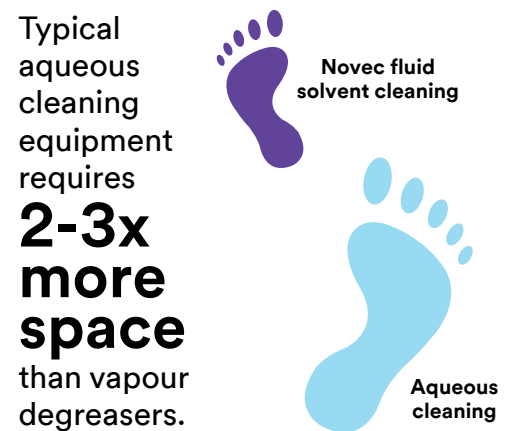


### Reduced fluid usage<sup>6</sup>



It's also important to consider the significant cost of waste water treatment and the extensive use of water, a precious natural resource.

### Smaller equipment footprint<sup>7</sup>



**3M<sup>TM</sup> Novec<sup>TM</sup> Engineered Fluids**

- Cleans a wide range of soils
- Evaporates quickly with no residue
- Variety of Novec fluids to meet your cleaning and materials compatibility needs
- Can be used in vapour degreasing, spray cleaning and hand wipe applications
- Non-flammable with a wide margin of worker safety
- Zero Ozone Depletion Potential (ODP) and very low Global Warming Potential (GWP)

**Smart. Safe. Sustainable.**

3M and Novec are trademarks of 3M.

## Benefits of Vapour Degreasing with 3M™ Novec™ Engineered Fluids vs. Aqueous

- 1 Low surface tension of 3M Novec Fluid allows more effective cleaning, rinsing and drying.
- 2 Novec fluid evaporates quickly with zero residue, eliminating the need for chemical rinsing or hot air drying.
- 3 Shorter cycle times for vapour degreasing with 3M Novec Fluid can help increase throughput and productivity.
  - Aqueous cleaning typically requires a 30 minute cycle time per batch.
    - ▶ 5 minute wash
    - ▶ 5 minute rinse #1
    - ▶ 5 minute rinse #2
    - ▶ 15 minute hot air drying
    - ▶ Two batches run concurrently
  - Vapour degreasing with 3M Novec Fluid typically requires 5-10 minutes cycle time per batch. For this analysis, we used a ten minute cycle time.
    - ▶ 6 minute pre-wash and immersion with ultrasonics
    - ▶ 3 minute vapour rinse
    - ▶ 1 minute freeboard dry
    - ▶ One batch at a time

4 This data is representational and may vary. It is based on the following assumptions.

- What are we cleaning?
  - ▶ 25.4 cm x 25.4 cm printed circuit boards, 10 boards per cycle
- How many boards per day?
  - ▶ **Aqueous: 320 boards per day (4 cycles per hour, 8 hours per day)**
  - ▶ **Solvent: 480 boards per day (6 cycles per hour, 8 hours per day)**
- What is the production schedule?
  - ▶ 5 days a week, 8 hours a day, 52 weeks per year
- Aqueous cleaning solution cost:
  - ▶ Price of concentrate: 34,30€ per 3.78 L
  - ▶ Cleaning solution concentration (diluted for use): 10%
  - ▶ Diluted cleaning solution usage: 1.89 L per hour (15.14 L per day) = 13,70€ per day
  - ▶ Changeouts: 2 per year, 37.85 L diluted cleaning solution per changeout = 0,26€ per day
- Deionized (DI) water usage cost:
  - ▶ 0,07€ per L
- Solvent cost:
  - ▶ Price: 92,07€ per 3.78 L
  - ▶ Usage: 3.78 L per week for evaporative and drag-out losses = 18,41€ per day
  - ▶ 2 fluid changeouts per year at 98.42 L per changeout = 18,41€ per day
  - ▶ Changeout cost can be reduced by using a boil down process to conserve fluid. Contact our technical experts for details

5 Solvent cleaning with 3M Novec Fluid can result in significantly less energy usage.

- **Aqueous cleaning requires more energy to heat the water and for hot air drying:**
  - ▶ Electricity costs are based on 0,13€ per kWh per U.S. average from U.S. Bureau of Labor Statistics
  - ▶ Electricity usage:
    - Aqueous requires 30 kW per hour (i.e. 14 kW per hour for washing and drying [ultrasonic tank, rinse tank heat, dryer heat, cleaning tank ultrasonics, rinse tank ultrasonics and pump and filter systems], plus 16 kW per hour external water heater)
    - Solvent cleaning with Novec fluid requires 8 kW per hour (i.e. heat, ultrasonics, pump, and primary and sub-zero chillers)
- 6 DI water usage for aqueous cleaning is 113.56 L per hour, or 908.49 L per day. Based on non-closed loop aqueous system. Solvent cleaning includes evaporative and drag-out losses.
- 7 Aqueous: 16.45 m<sup>2</sup>. 1.21 m x 3.65 m equipment plus 0.91 m x 0.6 m for external DI water heater. Solvent: 7.31 m<sup>2</sup>. 1.21 m x 3.65 m equipment.



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