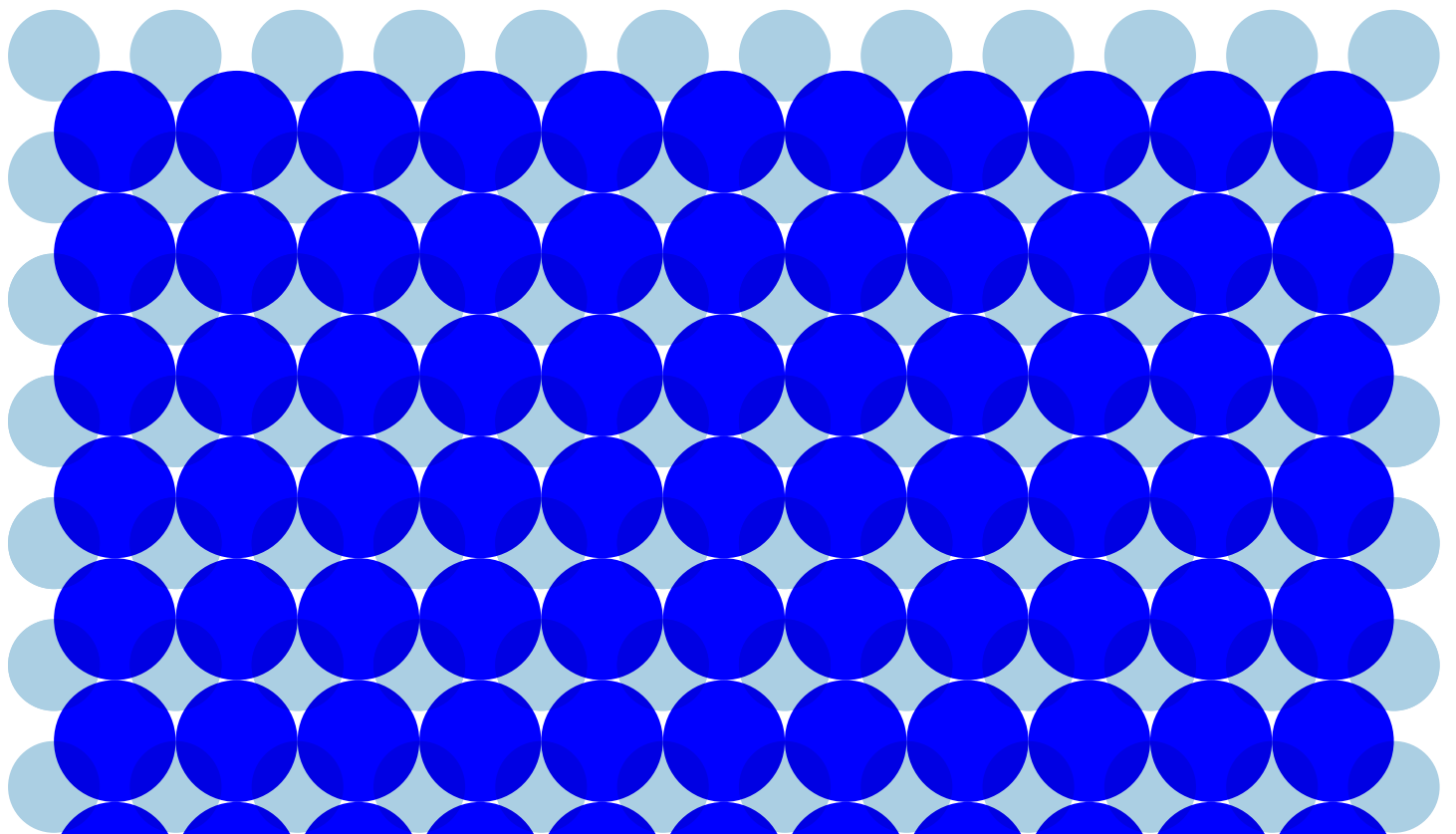


# Sustainable Twist to a Long-Established Product: The 2,6-Diisopropylaniline Case

Dr. Ulrich Mayerhöffer, Dr. Marie Hoffmann

Sustainability has rightfully become a societal goal over the last few decades. Today, our ecological impact can no longer be disregarded, and this also applies to the chemical industry which must operate eco-efficiently. As part of its vision and strategy (net zero by 2050), Arxada has decided to revamp the production of 2,6-diisopropylaniline, in order to give a sustainable twist to a long-established product with applications in various sectors, including pharma, agriculture and construction. This exercise resulted in a 35% reduction of the carbon footprint for this product.

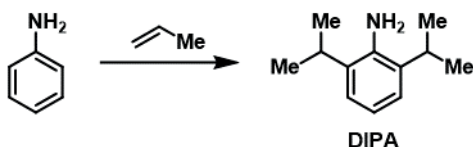


## Sustainable Twist to a Long-Established Product: The 2,6-Diisopropylaniline Case

With a worldwide willingness to do better for our planet, our legacy cannot be looked at on an individual level any longer. Together, we need to look up and commit to a better future, with all industries leading this transition. In that regard and as part of its net zero strategy by 2050,<sup>1</sup> Arxada is determined to make a meaningful impact. As a result, improving the eco-impact of its 2,6-diisopropylaniline process felt like a solid opportunity.

The 2,6-diisopropylaniline (DIPA, CAS 24544-04-5) is a bulky aniline with numerous applications and a worldwide production of around several thousands tons per annum. Used in and by several industries, it is now a mainstream product available in bulk from various suppliers, including Arxada who produces several hundred tons of it (Figure 1).

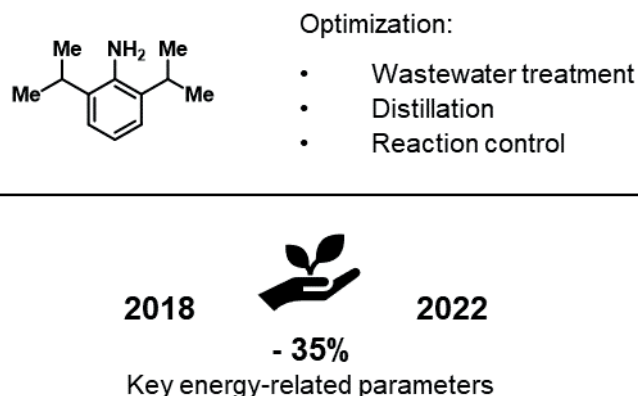
Figure 1: Arxada's production of DIPA



Arxada's DIPA is produced in Visp (Switzerland) which is located in the heart of the Swiss Alps. In the course of its journey towards a greener and more sustainable future, it felt highly relevant to focus on long-established products, such as DIPA, to make a meaningful impact.

The challenge was about revamping an existing and well-established process within a highly utilized multiproduct plant, in parallel to running production at full capacity. It required the intense and close collaboration of a multi-disciplinary team from different departments, including chemical R&D, engineering, operation, and business and was strongly supported by top management. The teams explored various options to improve the process further, focusing on process intensification, smarter downstream processing, and wastewater work-up (Figure 2).

Figure 2: Leverage and impact of the measures for a greener DIPA process<sup>2</sup>



For DIPA, some of the implemented key measures were:

- A new wastewater treatment system, switching from an energy-intensive stripping concept to a highly efficient extraction process to remove organics before discharge to the wastewater treatment plant,
- A new distillation concept for product isolation, reducing the absolute amount to be evaporated,
- Optimized reaction control to reduce the amount of catalyst, resulting in less water and lye during the work-up.

While mapping its energy consumption, as well as the waste generation for each production campaign of DIPA, Arxada took its 2018 production of DIPA as a baseline to measure and track later improvements transparently. After 2018 and during each campaign, besides the obvious output and quality of the product, key energy-related parameters, such as electricity, steam, and natural gas consumption, were measured. As of 2022, and compared to the 2018 baseline, the efforts and learnings did positively materialize, reducing the energy-related parameters by 35%.

<sup>1</sup> See <https://www.arxada.com/en/sustainability>, consulted in April 2023.

<sup>2</sup> Energy kWh was converted into kg of CO<sub>2</sub> according to the published annual CO<sub>2</sub> emissions per unit energy in Switzerland in 2021. For reason of simplicity, the 2021 reference was used to convert data for 2018 and 2022.

Those key energy-related savings (here 35%) can be translated into CO<sub>2</sub> equivalents that will not be released (Table 1).

Table 1. Some comparisons of the annual CO<sub>2</sub> (kg) emissions per unit energy (kilowatt-hour) and per country

	1965	2021
	In kg CO <sub>2</sub> / kWh	
China	0.33	0.26
France	0.28	0.12
Germany	0.32	0.19
Switzerland	<b>0.17</b>	<b>0.12</b>
United States	0.24	0.19

In other words, when the Arxada Visp site lowered the energy consumption of the DIPA production by 35%, hundreds tons of CO<sub>2</sub> were save for each campaign.<sup>3</sup>

In this table one can see that most countries drastically reduced the quantity of CO<sub>2</sub> that corresponds to 1 kWh between 1965 and 2021, which is a very positive signal. Additionally, Switzerland had and continues to have one of the greenest energy production. Ultimately, a very same process would be more eco-friendly in Switzerland or in France, compared to Germany, USA, or China for example.<sup>4</sup>

**In conclusion, a more sustainable process was established to produce DIPA in Visp, hence leveraging Arxada's expertise in process development and optimization, allowing tomorrow to be greener than yesterday. This successful implementation was possible thanks to passionate people with a shared vision and commitment towards continuous improvement & sustainability, as well as Arxada's customers' trust in better solutions.**

## Acknowledgments

This work was funded by Arxada AG, Peter Merian-Strasse 80, 4052 Basel, Switzerland.

## Author(s) information



**Ulrich Mayerhöffer**  
Head of the Chemical  
Technical Evaluation &  
Development team



**Marie Hoffmann**  
Senior Manager Business  
Development CDMO  
[marie.hoffmann@arxada.com](mailto:marie.hoffmann@arxada.com)

## Our offer

- Empowered teams
- 125 of experience in developing process and producing
- A vision and commitment for a better future
- Focus on what matters to you

If you would like Arxada to support your project(s) and/or give your process a sustainable twist, get in touch with:  
[myproject@arxada.com](mailto:myproject@arxada.com)

<sup>3</sup> According to <https://ourworldindata.org/grapher/co2-per-unit-energy?tab=table>, consulted in March 2022.

<sup>4</sup> Only 5 countries are represented in this table, but much more of them are listed in the corresponding website.



Arxada AG  
Peter Merian-Strasse 80  
4052 Basel, Switzerland  
Tel: +41 61 563 80 00

[www.arxada.com](http://www.arxada.com)  
[myproject@arxada.com](mailto:myproject@arxada.com)

All information in this presentation corresponds to Arxada's knowledge on the subject at the date of publication, but Arxada makes no warranty as to its accuracy or completeness and Arxada assumes no obligation to update it. All information in this presentation is intended for use by recipients experienced and knowledgeable in the field, who are capable of and responsible for independently determining the suitability and to ensure their compliance with applicable law. Proper use of this information is the sole responsibility of the recipient. Republication of this information or related statements is prohibited. Information provided in this presentation by Arxada is not intended and should not be construed as a license to operate under or a recommendation to infringe any patent or other intellectual property right. All trademarks belong to Arxada or its affiliates or to their respective third parties and are used here only for informational purposes. Copyrighted material has been produced with permissions or under license, all other materials.

© 2023 Arxada Ltd.