

Brief profile of subproject

Chemical and process innovation

1. Challenges

Chemicals used along the entire leather supply chain in various steps of production, processing and transport as well as their specific applications are essential for the quality of leather products, the safe execution of processes, but may also be involved with immissions and undesired contaminations. Making the leather supply chain “more sustainable” therefore inherently requires chemical and process innovations that provide new, future-oriented foundations for the production and processing of leather products.

The central role of chemicals used in the supply chain also draws attention to the production of the substances employed. In the leather supply chain, the situation appears to be complex due to involvement of global networks. The production of raw hides, the various stages of tanning, finishing, subsequent processing into leather products and, last but not least, the trade in intermediate and end products usually takes place across national borders, often even across continents. Each step including the respective transport phases may require the use of effective chemicals. While in Europe a whole series of measures, regulations and standards have been adopted and are effectively implemented for the application and production of chemicals, this is not necessarily the case for emerging and third world countries where part of the leather production takes place.

Furthermore, not all suppliers of leather chemicals, particularly in emerging and third world countries, do have specific process know-how and are able to offer effective support for a more sustainable usage of leather chemicals.

The chemical industry as a supplier of leather chemicals is subject to a constant worldwide change due to increasing regulatory, social and economic challenges, which must be encountered by technical and organizational potential. Current production processes must be further optimized in terms of raw material base, energy, material, and personnel deployment, but also in terms of flexibility, quality, and production resilience. Usually, it is easier to optimize production processes for higher value-added chemical products. However, optimization of production processes is socially and economically desirable for all chemical products worldwide.

Further obstacles with regards to the global environmental compatibility of production and the use of chemical products are also due to the competition between European chemical companies and, among others, Asian companies. The latter companies are often able to offer products for lower prices with lower environmental standards, but are currently central to the economy of the respective country.

Various initiatives are currently developing guidelines for companies on the use of chemicals (e.g. ZDHC) or on environmental standards (e.g. LWG).

In the course of the technical and organizational development of leather production and processing, the challenge is therefore how chemical products and their production can contribute to more sustainable processes along the supply chain. Current news from the market indicates an increasing upheaval in the production of leather chemicals and a shift from Europe to Asia. Recent developments in the wake of the coronavirus pandemic are likely to lead to a further review of supply chains, the outcome of which can hardly be predicted at present.

2. Objective & project description

The aim of this sub-project is to contribute to further development of manufacturing processes leather chemicals based on an analysis of the chemicals currently in use. In particular, future requirements for leather chemicals and their manufacture are to be examined concerning the increasing demand for "more sustainable", i.e. resource and energy-saving and generally environmentally friendly as well as health-compatible production methods, products and their applications. This sub-project thus contributes to a "more sustainable chemistry", which includes (eco)toxicological aspects as well as a life cycle assessment approach to potentially quantify environmental impact of production and use of chemicals within the leather supply chain.

The selection of leather chemicals is of course based on the processes employed, so that process innovations are also within the focus of this investigation. In addition, it will be examined to what extent modern aspects of chemical production such as miniaturized, modularized and/or decentralised production, conversion from batch operation to continuous operation mode as well as automation and modern recycling management can contribute. Impulses from concepts of process intensification and green chemistry or green engineering are expected. In particular, the substitution of substances that can be classified as problematic could be economically promoted, for example by improving raw material and/or energy efficiency and the CO₂ footprint. Another possible group of topics are expected to emerge from the medium-term shortage of crude oil, which induces the search for an alternative raw material base and intelligent recycling management. In view of the economic challenges, the question arises for every company how to simultaneously produce more "sustainably" and more economically and how, at least initially, to absorb the additional costs arising after a transformation towards more sustainable production.

Ultimately, however, proposals for chemicals for leather production and processing and their manufacturing processes must be competently evaluated, which requires the development of comprehensive evaluation criteria including balanced individual criteria in the sense of a life cycle assessment of chemicals.

3. Research and transfer questions

The following remarks are intended to provide impulses and are expected to be developed further, sharpened towards higher precision and elaborated based on the expected discussion within the project group.

Forschungs- und Transferfragen:
What is the role of the chemicals currently used in the leather supply chain and their manufacturing processes in relation to the requirements of a "more sustainable chemistry"?
Which technical and organizational potentials may arise for the chemical industry with regards to the manufacturing processes of leather chemicals and to the development of new leather chemicals?
Which evaluation criteria for leather chemicals and their future / modern manufacturing processes will be useful to evaluate the development concerning a long-term successful transformation?
How can future process innovations in leather manufacturing contribute to making the supply chain as a whole, and in particular the chemicals used, more "sustainable"?
Can the results obtained contribute to the identification of substances recommended for use in the leather supply chain and, if necessary, lead to methodological additions to the current creation of positive lists of suitable substances?

4. Structure

The project is coordinated by a tandem consisting of one representative from the Darmstadt University of Applied Sciences and from practise. Anyone interested can participate in the project.

The cooperation takes place via meetings / web conferences / workshops.

Project group coordination

Representing Darmstadt University of Applied Sciences: Prof. Dr. **Frank Schael / M. Eng. Patrick Rojahn**

Representing the practise: #tbd

Developmentplan:

Major project steps (partly running parallel)	Format(e)
0. Initiation of project group	Agreement on short profile, kick-off webinar
1. Expansion of the group by relevant stakeholder	Network Analysis
2. Detailing the tasks & objectives	Desk research, surveys
3. Analysis of the current situation	desk research, expert interviews

4. Developing an evaluation catalogue for new organisational and technical developments in chemical and process innovation	desk research, literature studies, expert interviews, online webinar
5. Development of a tool for the evaluation of leather chemicals along the supply chain with regard to economy and sustainable development	desk research, literature studies, expert interviews, online webinar
6. Elucidation of possible technical and organisational potentials of manufacturing processes for leather chemicals	desk research, expert interviews, online webinar
7. Possible demonstration of selected potentials	t. b. d., case study of selected aspects, online webinar