

# ACIDLOOP POLICY BRIEF

## Technology Transfer and Applied R&D in the Indian Metal Finishing Sector

### Background

The metal finishing sector handles tasks such as surface cleaning or preparation, surface treatment, and rinsing and drying of metal parts. Metal finishing operations include chemical and electrochemical conversions, diffusion coating techniques as well as case-hardening techniques. These processes require the usage of acids and other chemicals which have the potential of causing severe environmental damage if released into the environment or treated improperly. The share of Micro, Small and Medium sized Enterprises (MSMEs) in the Indian metal finishing sector is rather large. Due to their small size and thus capacity and resources, MSMEs, and especially micro and small units, have often low environmental as well as health and safety standards in place. Given the low standards of MSMEs in these areas, the polluting nature of the metal finishing process and the large share of MSMEs in the metal finishing sector, this sector is rather promising as target for the promotion and implementation of technological options to make operations more resource-efficient.

Currently, however, there is a **lack of adequate affordable technologies available to Indian metal finishing MSMEs to make their operations more resource-efficient**. This finding was one of the results of the **policy dialogues conducted as part of the ACIDLOOP project at the beginning of the project in 2012**. During these events, MSME representatives voiced an urgent need to gain access to state-of-the-art technology and to technical knowledge of research institutions to enhance their operations.

Demonstration units and pilot plants for more resource efficient processes in the metal finishing sector exist. Research institutions, large companies as well as progressive MSMEs in India and around the world develop processes which save resources and inputs compared to a business-as-usual scenario in Indian MSMEs. Yet, many of these existing technologies do not make the transition to the ground and are not used by the MSMEs. At the same time, many research institutions are not aware of the needs of the MSMEs. This results in the development of technologies which lack the practicality to be used by MSMEs in the metal finishing sector on a larger scale. Reasons for this knowledge and access gap are a **lack of engagement in research and development (R&D) by the MSMEs themselves** as well as the **absence of strong collaboration models between MSMEs and research institutions** to enable technology transfer and the sharing of needs.

Most countries have a policy framework in place for supporting and strengthening the linkages between industry and R&D institutions as well as encouraging R&D activities and uptake by MSMEs. India has various programmes to encourage technology transfer. Yet, **in the Indian MSME metal finishing sector the existing approaches for technology transfer have been of limited success** to this date.

In this policy brief, the ACIDLOOP team therefore assesses why the current system of technology transfer is not as successful as it should be. The project team also presents several options on how to improve the access of MSMEs to suitable resource efficiency technology and foster innovation and technology transfer in the Indian metal finishing sector. The problem analysis as well as the suggestions are based on a first draft of this policy brief which had been presented to and discussed with various stakeholders at a policy dialogue event in Delhi in September 2014. Participants' feedback and the results of the discussions have been incorporated in this second issue of the policy brief.

## Problem Analysis

Reasons why the technology transfer from research institutions to MSMEs is not as successful as it should be cannot be attributed to a single stakeholder group. MSMEs, research institution and even actors of the broader environment in which the companies as well as research institutions operate are responsible for the current situation.

### Research institutions

Generally, there is a tendency in the **Indian research** landscape for **institutions to focus on fundamental research**. MSME support is not a priority for most research institutions. Fundamental research becomes relevant to companies only in the long-run and benefits larger enterprises that can use the results to develop them further in their own R&D centres. **MSMEs, however, benefit more from applied research** that targets specific products or production processes. This type of applied research and the transfer of newly developed technologies to MSMEs is in most cases not the mandate of research institutions. What oftentimes matters more for researchers and scientists than patents and commercialised products are articles in peer-reviewed journals. Of course, technology development and dissemination also requires **human and monetary resources that research institutions often lack**. In cases where research institutions do actively support MSMEs, for example by offering capacity building programmes as CECRI (Central Electrochemical Research Institute) does, MSMEs are often not aware of these services as the research institutions have no incentives to make such information widely available.

### Industry / MSMEs

Obtaining new technologies is relevant for companies in two ways: first, companies can access new technological solutions through the uptake of technologies that someone else has developed; second, companies can, by themselves or with the support from other actors, engage in R&D activities and come up with new technological solutions by themselves. For MSMEs, the **challenge of sustaining business operations and the daily routines usually do not leave sufficient time for engaging in R&D or the uptake of new technologies**. An

exception to this may be few progressive MSMEs and early adopters who actively seek for opportunities to grow. Especially in the field of sustainability entrepreneurship, innovative production methods can receive national or even international media attention and access to funding. However, for becoming visible in this field, resources are required upfront that many MSMEs lack.

A common problem among MSMEs regarding technology uptake is often a **general resistance to change** and thus the preference for sticking to accustomed production patterns. MSMEs may have a **narrow focus on local technology approaches** and therefore lack awareness on other available technologies or even national and international best practices. This is reinforced by a general **scepticism regarding the benefits of more resource efficient technologies** and a **lack of faith in scientific institutions** that promote these technologies. MSMEs usually **lack a long term perspective on sustainability issues**. Therefore, investing in more resource efficient technologies is not attractive. Many MSME strongly rooted in the community are also reluctant to invest in technologies that cut down on labour requirements due to **societal obligations** regarding their position as an employer.

Very importantly, MSMEs face considerable **capacity constraints** that prevent them from investing in new resource efficient technologies or even engaging in own research activities. For many MSMEs there are considerable knowledge constraints as they are just **not aware of the existing support framework for R&D and technology transfer**. Even if companies are aware of support options, they may be reluctant to **discuss their problems and hence improvement potentials with other actors, for example government institutions like the State Pollution Control Boards (SPCBs)**. Many companies fear adverse action from government authorities in case that they do not meet certain norms.

From the financial perspective, most **MSMEs cannot afford the substantial up-front investments** for new technologies. Also, a **strong competition on prices** does not allow them to experiment with innovative technologies. The **scale of operations in MSMEs is often too small to implement certain technology options** as they would require higher production rates for an acceptable pay-back time. Regarding human capacities, MSMEs often **lack the professional staff** to identify and implement relevant new technologies

### Other stakeholders

Technology transfer is not only a matter of companies and research institutions. A host of other actors may also directly and indirectly contribute to a successful system of technology transfer. Of course, for most other actors it is not a key mandate to support technology transfer for MSMEs. Yet, due to their wider mandate or economic interests they should have an interest in a functioning model of technology transfer for resource efficiency technologies.

From the government side, **environmental authorities** such as SPCBs are sometimes unaware of relevant resource efficient technologies for metal finishing MSMEs. With their mandate to prevent pollution and thus foster resource efficiency they would be an ideal actor to support technology transfer. Yet, most SPCBs have not yet taken the role as service and knowledge provider offering advice on technological option but still mainly enforce the achievement of particular environmental parameters. Currently, they do not reward any additional efforts by companies to increase their resource efficiency.

**Financing institutions** are also important stakeholders with respect to technology transfer. By restricting access to financings for MSMEs they prevent them from purchasing new technologies.

**Industry associations** that are widely spread in India could play a more prominent role in supporting technology transfer. Many of them have the capacity to bring together research institutions and industry enterprises but do not yet exploit this potential.

Another problem with respect to resource efficient technologies as such is that international technologies are only insufficiently adapted to Indian conditions. Here, **technology providers** could engage more actively in the adaptation of technologies to the Indian conditions, with potential economic benefits for them as well as the companies.

Finally, activities at the **customer level** also influence the dissemination of more resource efficient technologies: so far, there is a lack of pressure from companies' customer (mainly other companies) on MSMEs to engage in cleaner production and therefore provide an incentive for the MSMEs to change production patterns towards more resource efficiency in the production process.

## Recommendations

Based on this problem analysis, the ACIDLOOP team suggests taking up the following points to enhance the current framework of technology transfer and applied R&D for MSMEs in India. Recommendations are provided for four areas of intervention, namely (1) cooperation, (2) awareness, (3) support programmes; and (4) funding. All approaches should take into account the specific conditions and requirements of the metal finishing sector as well as the respective regional context.

### (1) Cooperation

The **cooperation between the different stakeholder groups** relevant for a successful transfer of technologies from the research stage to the application in the industry **needs to be improved**.

On the **regional and local level in India**, cooperation between state institutions such as MSME development institute, SPCBs, or regional Cleaner Production Centres and the metal finishing MSMEs needs to be increased. Regional institutions often know the specific local context better than national institutions and can directly cater to the technology needs of MSMEs in a particular region. Besides cooperating with formal institutions, **MSMEs could also benefit from stronger cooperation amongst each other**, for instance regarding joint applications for research funding. Joining forces for application processes may increase the share of MSMEs engaged in industry-led R&D. **Customers of metal finishing MSMEs** (e.g. from the automobile and sanitary sector) **could engage in broader cooperation with their respective suppliers** and provide them with information on resource efficiency production techniques and technologies. This would yield benefits for both the MSMEs and their customers as less resource-intensive production processes may increase the profit rate of MSMEs and still bring down prices for customers.

Actors on the **national level**, e.g. the Department of Science and Technology, the Department for Scientific and Industrial Research (both from the Ministry of Science and Technology) as well as CECRI, universities and national metal finishing associations need to work together with MSMEs more closely to address the capacity and resource gaps of MSMEs. The national metal finishing associations could take a stronger role in expressing and sharing the needs of the MSMEs on the national level vis-à-vis national government authorities.

On the **international level**, cooperation models between **India's and the European Union's research institutions** could be established, specifically targeting MSMEs' research needs in the field of resource efficiency.

A specific solution for increased cooperation could be **the promotion of existing cluster initiatives or the setting-up of new clusters or**. Clusters can help to facilitate the transfer of research needs from the company side to research institutions and strengthen technology transfer from research institutions to MSMEs. Moreover, cluster initiatives can also serve as service providers to MSMEs in promoting existing government programmes and making them accessible for the MSMEs.

## **(2) Awareness**

**Awareness must be created** at the level of MSMEs that technologies exist that can enhance their production processes. Knowledge needs to be provided to MSMEs and their associations (especially at the regional level) where information on suitable technologies can be obtained. National (e.g. DST, DSIR) and State Government institutions (e.g. Industry Department, MSME development institutes), international donor organisations, research institutions, technology providers and financing institutions can serve as disseminators of such information. They must be convinced that it is in their interest to make information on resource efficiency technologies available to MSMEs. **Cluster initiatives and industry associations are a natural entry point for raising awareness** around resource efficiency technology options. Through them, the higher level actors can disseminate knowledge on a broader level.

The better all stakeholders involved in the technology transfer process are informed, the better technology transfer will function to the benefit of all. At the MSME level it is important to create awareness for the various possibilities and benefits of increased cooperation on technology development and transfer as well as of technology transfer itself. For the uptake and implementation of new technological solutions, it is crucial that also **workers (and not only company owners) are made aware of the implications of sustainability issues in general and of resource efficient production in particular**. This may allow them to identify steps in the production process where improvements can be implemented. A step towards involving more workers in the innovation processes around the production process would be to translate education materials to local languages.

## **(3) Support programmes**

**Support programmes on all levels need to be tailored specifically to the needs of the metal finishing sector**. Government support programmes with a sector focus exist in India, for example, for the biotech or IT sector. The same should be in place for the metal finishing

sector, thereby involving relevant stakeholders on the national and regional level. Through these programmes, the metal finishing sector should be supported in the development and uptake of resource efficient technologies.

In terms of content, **support programmes should focus on actually improving operating practices** in the MSMEs instead of only suggesting the implementation of new technology. Also, they should further promote the idea of cooperation, e.g. by establishing linkages between industry and academia. For instance, **MSMEs and universities could jointly supervise a master's or PhD thesis** that deals with a specific research need formulated by an MSME. A further example of a concrete support programmes could be that associations or clusters initiatives hire or create a **pool of experts** to improve the quality of operations in the member companies. Research institutions should **directly engage with MSMEs** to assess their challenges and problems, to be then able to address these challenges and to **offer training programmes specifically tailored to the needs of the MSMEs**.

#### **(4) Funding**

**Available funding for technology transfer and applied research in general, and the metal finishing sector in specific needs to be increased.** With the increase in funding that could be directed to the establishment of incubation centres, the set-up of cluster initiatives and government support programmes, the conditions of funding need to be changes as well. This means that timely decisions for the sanctioning and disbursement of funds to engage in research of or invest in resource efficient technologies need to be made. In addition, the duration of funding for research cooperation projects needs to be increased. **Financing institutions could offer financial models flexible enough to suit MSMEs** and direct these funds to specific technologies. **Furthermore, large enterprises and industry associations could co-fund research initiatives of MSMEs.**

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For further information please consult the extensive policy report on technology transfer in the Indian metal finishing sector. The report is accessible on the ACIDLOOP project website [www.acidloop.in](http://www.acidloop.in)

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