Electrochemical Discharge machining (ECDM) for conducting and non-conducting ceramics

Group no. 17

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Source: KRC Machine Tools and solutions

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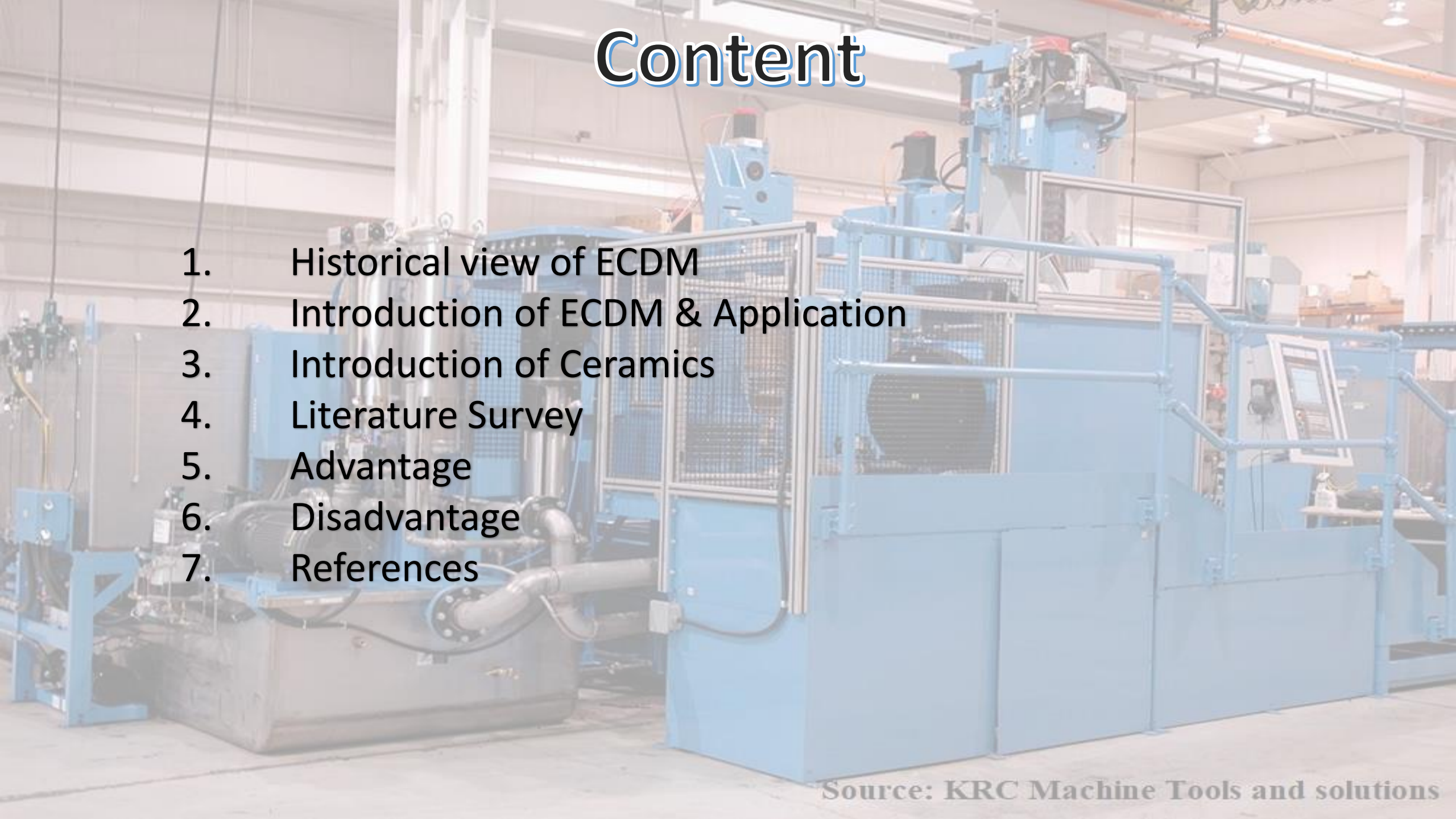


Introduction

What is ECDM?

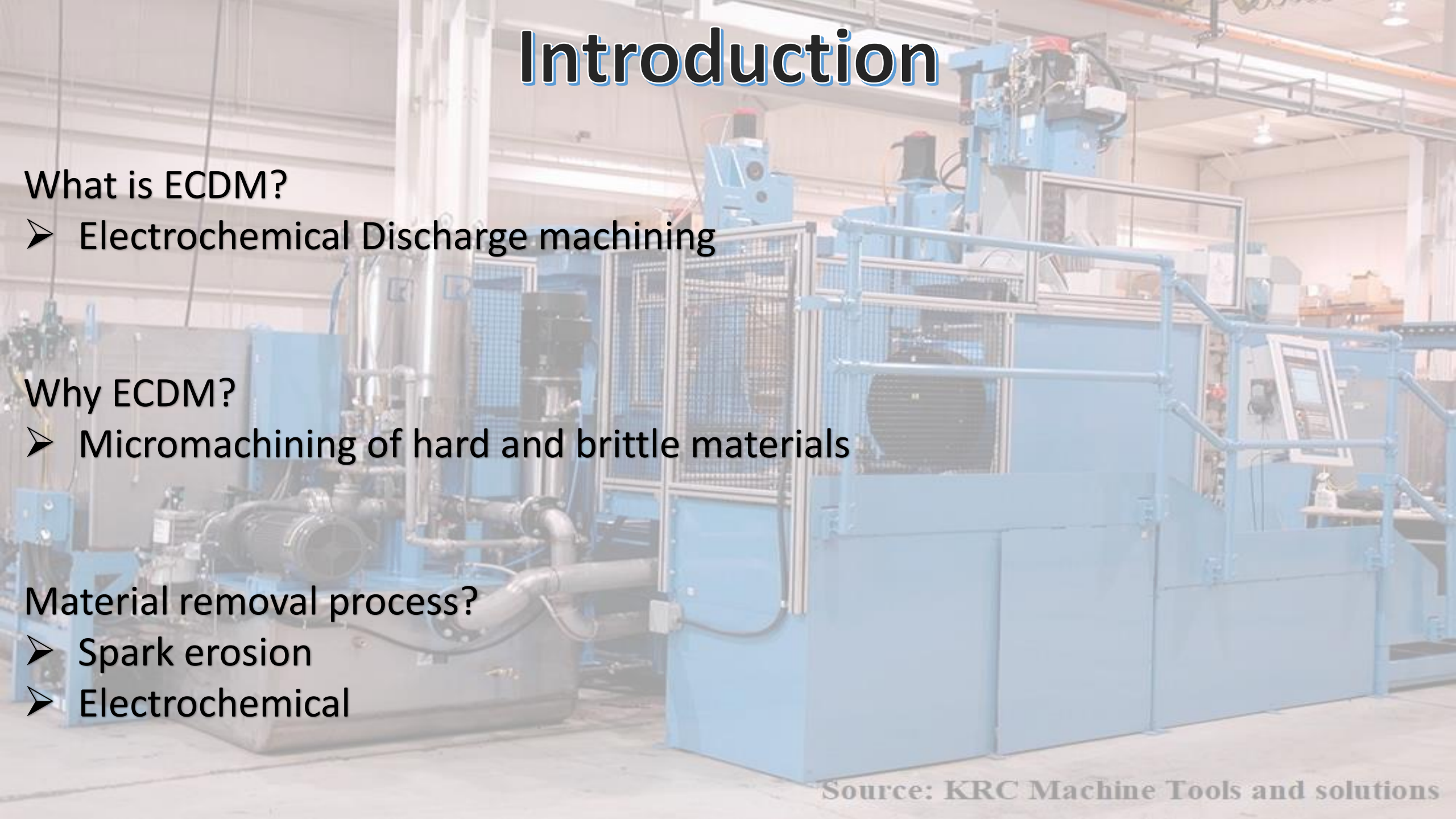
- Electrochemical Discharge machining

Why ECDM?

- Micromachining of hard and brittle materials

Material removal process?

- Spark erosion
- Electrochemical



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Introduction

What are ceramics?

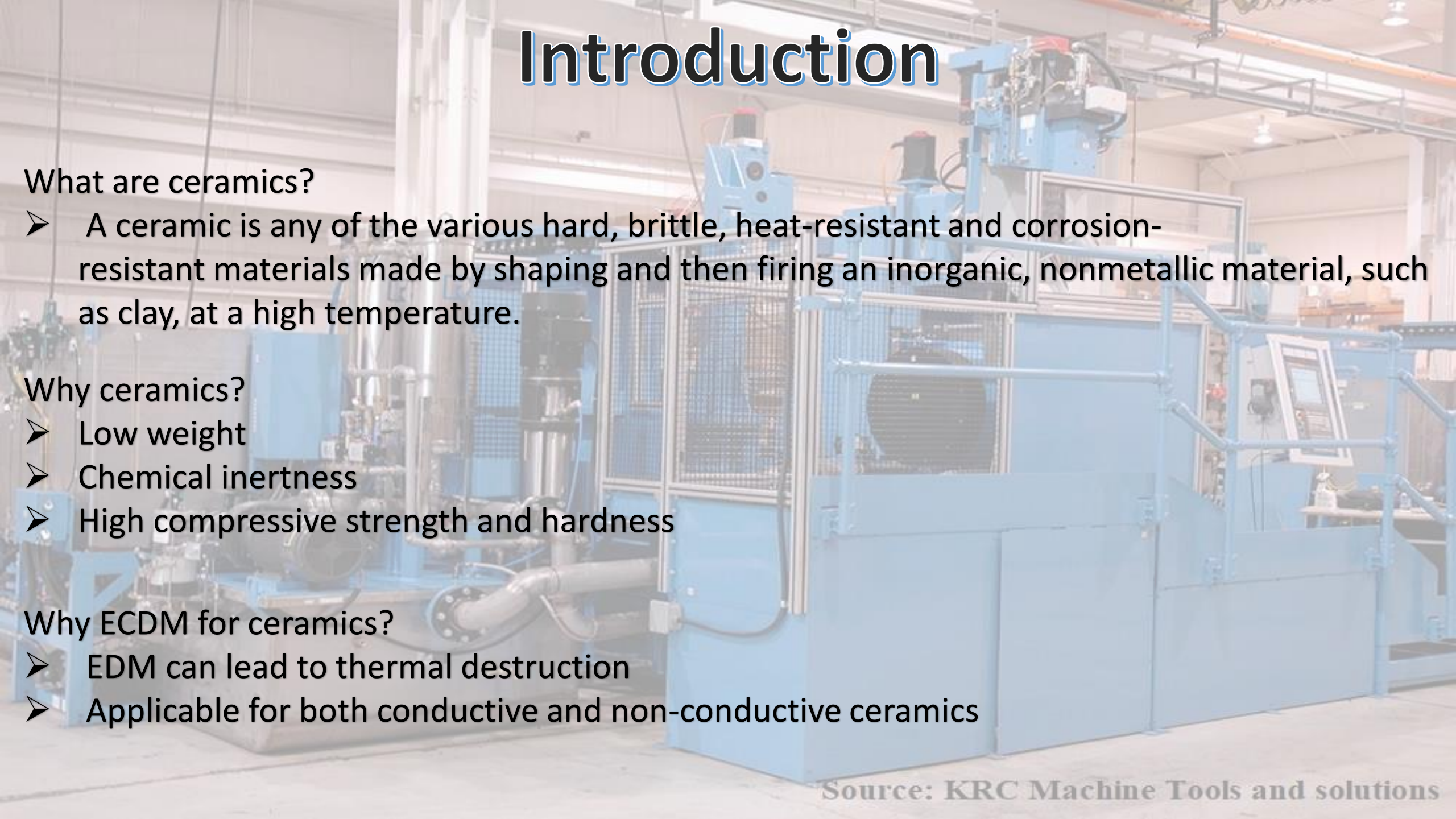
- A ceramic is any of the various hard, brittle, heat-resistant and corrosion-resistant materials made by shaping and then firing an inorganic, nonmetallic material, such as clay, at a high temperature.

Why ceramics?

- Low weight
- Chemical inertness
- High compressive strength and hardness

Why ECDM for ceramics?

- EDM can lead to thermal destruction
- Applicable for both conductive and non-conductive ceramics



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Literature survey

1. B. Bhattacharyya *et al,* studied the effects of variation in process parameters on MRR and overcut in ECDM. It was concluded that the machining rate for ceramic materials is low in ECDM process but it is more effective in machining for non-conductive materials.

2. Manpreet Singh *et al,* conducted experimental investigation for generation of micro-holes on silicon wafer using ECDM. The process parameters like applied voltage and tool feed rate on drilling of micro-holes on Silicon wafer were observed.

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Literature survey

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4. Ankit D.Oza *et al, is reviewed electrochemical discharge machining process and future scope ECDM is newly developed non-traditional machining process and has great potential for machining of various non-conducting materials.*

5. *Sanjay k. chak* et al, this study revels that much has been discuss about electrochemical discharge phenomenon and its application while machining electrically conductive and electrically non-conductive materials.

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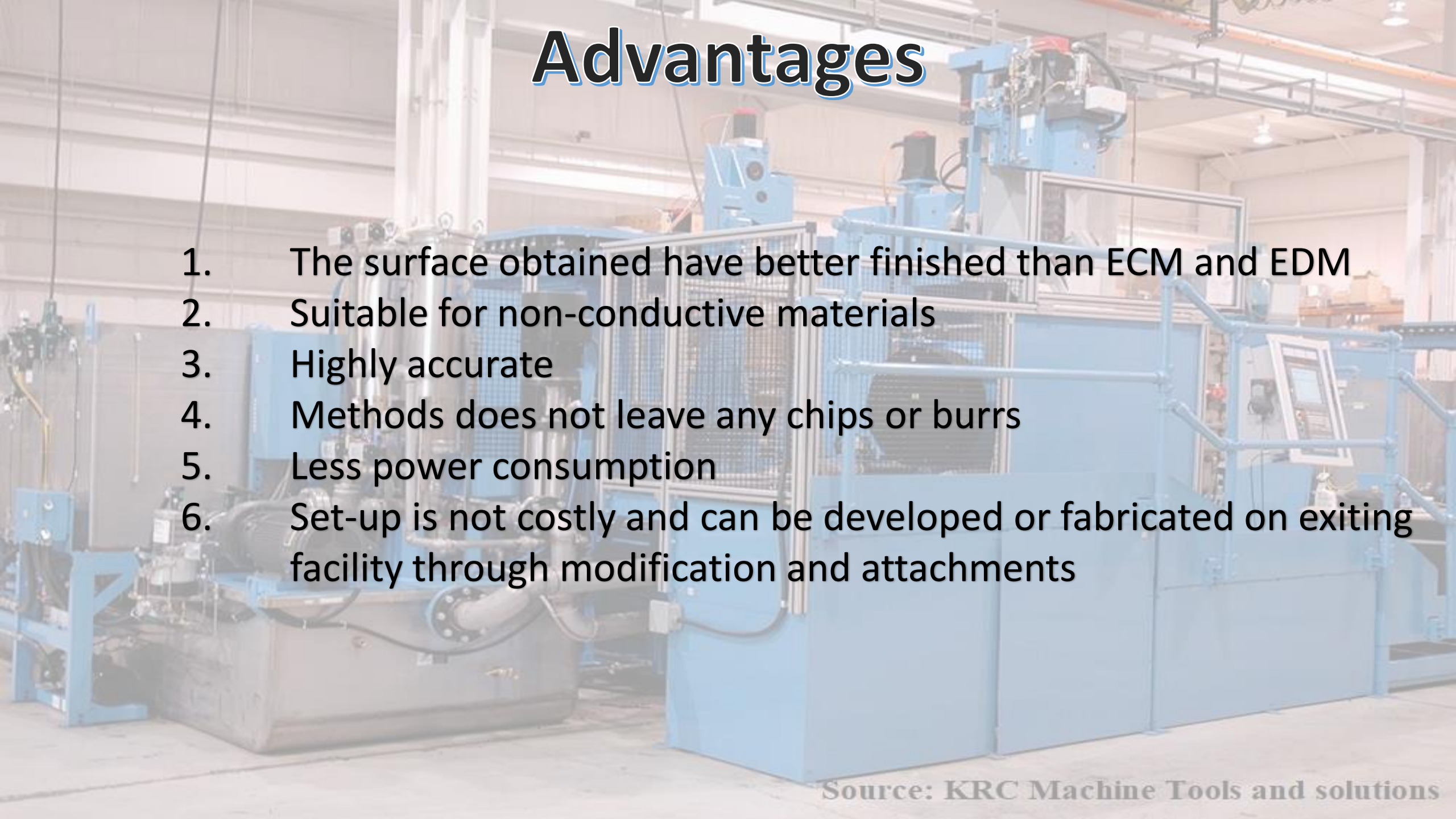
Advantages

1. The surface obtained have better finished than ECM and EDM
2. Suitable for non-conductive materials
3. Highly accurate
4. Methods does not leave any chips or burrs
5. Less power consumption
6. Set-up is not costly and can be developed or fabricated on exiting facility through modification and attachments



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Disadvantages

1. Chances of electrode wear and tear
2. Initial cost is high
3. Thickness of ceramic material can be machined is limited to 1.5mm
4. Radial overcut

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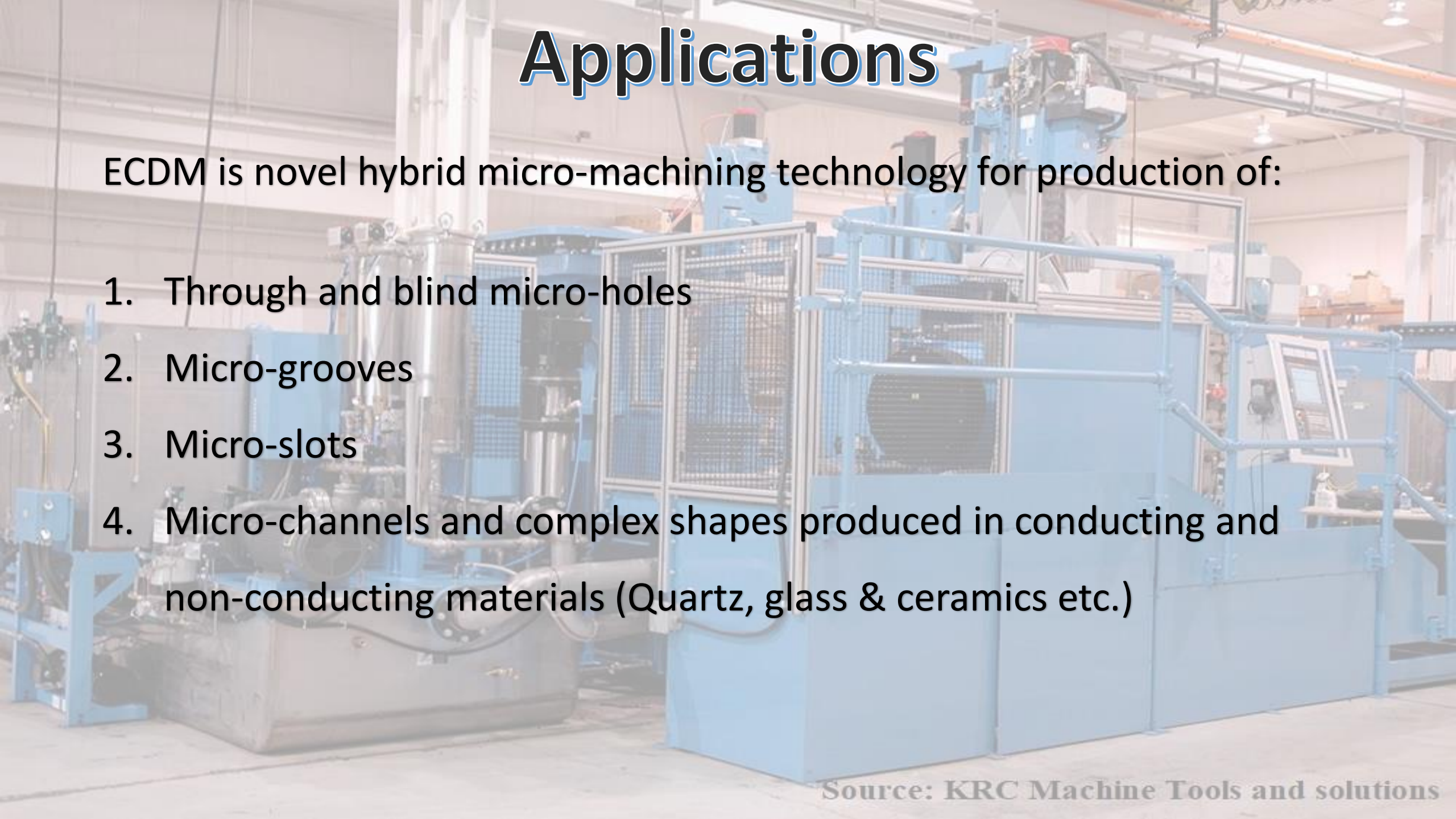
Applications

ECDM is novel hybrid micro-machining technology for production of:

1. Through and blind micro-holes
2. Micro-grooves
3. Micro-slots
4. Micro-channels and complex shapes produced in conducting and non-conducting materials (Quartz, glass & ceramics etc.)



Applications

ECDM is novel hybrid micro-machining technology for production of:

5. Miniature features of turbine blades
6. Filters for food and textiles industries
7. Micro-electro seam welding
8. Industrial applications like bearings, computer parts, artificial joints, cutting tools, electrical and thermal insulators etc.
9. Trueing and dressing of grinding wheels