

# Cutting Fluids: A Researcher's Perspective

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ISSN: 2640-9690



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**Submission:**  October 02, 2024

**Published:**  October 07, 2024

Volume 5 - Issue 4

**How to cite this article:** Roopsandee Bammidi\*, Dowluru Sreeramulu and Durgaprasad Kelli. Cutting Fluids: A Researcher's Perspective. Evolutions Mech Eng. 5(4). EME.000619. 2024. DOI: [10.31031/EME.2024.05.000619](https://doi.org/10.31031/EME.2024.05.000619)

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## Abstract

In present scenario, the cutting fluids had become most popular area in research wing for the industrial applications. Machining had become most prestigious field that impacted the cutting fluids. The scientist and researchers still are working for the development of cutting fluids. In this manuscript, the short communication regarding a brief overview of cutting fluids had discussed by addressing the importance of cutting fluids and its impact on machining and its environments.

**Keywords:** Cutting fluids; Disposal; Environments; Cutting fluid types; Applications

## Introduction

We are familiar that the cutting conditions had critical impacts in dry machining. To overcome these impacts, the cutting fluids are introduced at cutting zone which certain improvements takes place in different forms basing on the cutting conditions, fluid that applied and materials of work and tool. The cutting fluids act as both lubricants and coolants in machining world. These had different actions based on the cutting speeds. Coolants and lubricants are applied at higher and lower cutting speeds depending on the amount of chip removed. In the industrial scenario of present world, the cutting fluids had a vigorous role in its applications that are widely used. In practical, there are different oils bases of cutting fluids such as vegetable and mineral oils. The oil free fluids are also available and those are of chemical compounds like polymers, generally called to be synthetic fluids. The oils that are of neat type and emulsion type are being used in advanced technologies of machining where action of cooling and lubrication are focused. The cutting fluids are categorized into different types and its type of nature shown in Table 1. With critical studies in this area and allied, the cutting fluids are widely applied in huge number of industries. From a literature study, over 20% of manufacturing cost depends on the application of cutting fluids while cutting tools acquire a share of 8%. There are significant benefits of cutting fluids, occupies a space in all types machining operations. The quantity of different cutting fluids that consumes over the globe is shown in Figure 1.

**Table 1:** Categories of cutting fluids and its type of nature.

Type of Cutting Fluid	Type of Nature
Neat Oils (Straight Oils)	Undiluted and Mineral Oils
Soluble Oils	Oils with Emulsifiers
Synthetic Fluids	Oil Free Solutions
Semi-Synthetic Fluids	Combination of Soluble Oils and Synthetic

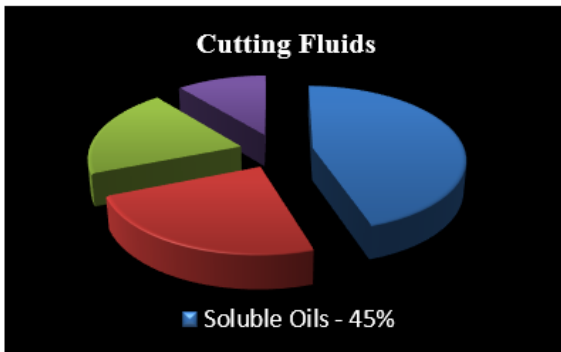


Figure1: Percentage utility of cutting fluids in industrial markets.

### Cutting Fluids

The cutting fluids are one of the best options in controlling the manufacturing cost in any of the industries. It occupies a major share in reducing the cost in allied areas of manufacturing like automotive and aircraft industries [1,2] by the practical applications of different cutting fluids [3-5]. These different types of cutting fluids are applicable in the form of lubricants and coolants that depends on product. In machining processes, the perfection and performance depend on the application of cutting fluids and achieves maximum number of advantages such as prolonging of the tool life, very fine surface finish of work material, reduction in friction, temperature and, thermal distortion, etc. Flushing action is one of the fetching parameters in the cutting fluid applications which helps in carrying away of chips from the interface region of work material-cutting tool. The nozzle of fluid must be properly arranged in the setup of experimentation so that chips won't escape by hiding with any contact region. The characteristics of any cutting fluid depend on type of the application. The direct contact occurs due to fail in maintaining the hydrodynamic films [6]. The boundary lubrication is affected by the nature of boundary layer. The lubricants with nature of reactive ingredients offer an excellent surface finish and surface protection. Under various critical conditions, the cutting fluids are applied to machining process which reduces wear, friction and, power consumption that increases life of cutting tool and surface finish. The cutting fluids fail to perform outstandingly when the delivery of cutting fluid at cutting zone is not good. The lubricating properties must of any cutting fluid perform films on the sliding surfaces.

The application of it had a fluctuation in temperature that forms micro cracks for any material and also impacts on tool life. In present day industrial applications, only four methods are existed for fluid applications such as Mist, Jet, sand Manual and Flood applications. Cutting fluid application through tool is one

of the major applications generally observed in drilling processes. This type of application primarily flushes away the chips that are formed [7]. The maintenance of cutting fluid is also a crucial factor that extends the life of tool and economical with respect to frequent disposal rather than permanent replacement. These cutting fluids generally don't wear out but occupies a contaminant property day-by-day. If the concentration of coolants is restored and maintained regularly with removal of contamination, then the life of cutting fluid extended. The bacterial growth is one of the significant factors which concerned with coolants. Maintaining clean cutting fluids is one of excellent and effective solution in industrial environments. The regular testing of cutting fluids is necessary for good performance. With the applications of cutting fluids, the bacterial growth and aerosols are the environmental considerations that had an impact in the atmosphere. This must be controlled with frequent testing and maintenance of cutting fluids and with special care in the disposal of it. The problems like machine residue, rusting and odor, foaming and poor tool life and, skin irritation for the machinist can only be controlled when perfect disposal of the cutting fluid takes place. To overcome these specific issues, many researchers and scientists working from last two decades in recent developments and suggested various techniques that involve very near dry machining conditions and one fine day named this technique as Minimum Quantity Lubrication (MQL) and related reviews explained [8].

### Conclusion

This manuscript in brief concludes that importance and role of cutting fluids in manufacturing industries and had discussed various parameters regarding this allied area with extreme attention towards different types of cutting fluids, machining parameters, fluid flushing nature and, environments. It also gives an idea regarding the maintenance and disposal of cutting fluids in machining processes and related issues.

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