SUMMARY FOR Nagar 1985

3.c Equipment maintenance and operations audit:Nagar 1985:HE STATES THAT Lubricating oils lost by leaks and other unnecessary circumstances to the environment in industrial manufacturing plants amount to 100 million gallons per year. In textiles lubricants are used for such uses as crankcase oil, heat transfer fluids, transformer oils, process oils, machine lubricants, bearing greases, etc. With proper leakage control and preventive maintenance of systems, 75% of this is avoidable. Three drops per second drip from a seal amounts to over 1300 gallons per year into the environment. Steps to prevent this are (1) use of proper materials in constructing systems, (2) proper training of maintenance workers to recognize leaks and properly repair them, (3) design systems with minimum numbers of joints and potential leakage points. It is also important to ensure that lubricants do not become contaminated in service, thereby requiring replacement more often than necessary. A list of contaminants that need to be avoided through system design or administrative or engineering controls is given. For textiles, contamination originates from incompatible greases from other parts, lint, packing/gasket fragments, rust, paint flakes, pipe scale, water, etc. A maintenance checklist for reservoir maintenance includes tightly fitting lid with proper gasket and secure seal, proper oil filter, and air filter over breather. Lubricant can also break down thermally, and the proper operating temperatures/oil selection should be a priority.:MY COMMENTS

# OPTIMUM UTILIZATION OF LUBRICANTS IN TEXTILE MILLS

By A.M. Nagar[1]

CONSERVATION of our natural resources and improvement of our environment have become common place goals of society today. When a single operation by modification can contribute to both environmental improvement and conservation of natural resources, its achievement is to be highly recommended. Control of lubrication within the plant to prevent the generation of oily wastes is just such an operation. Any lubricant that becomes a waste, is a cost item from the point of view of material purchase and waste disposal. From the conservation point of view, a plant lubricant loses its effectiveness because of:

(a) Contamination with water, foreign matter, dust, process materials, wear materials and fuel dilution.

(b) Degradation during use due to depletion of additives, increase in total acid number, formation of oxidation products, change in viscosity or loss of lubricity. Also, excess consumption may be due to escape from system through leaks, spills or drips, excess lubricant in All-loss system, carry off of products in process etc.

The key to get the optimum from a lubricant lies in the selection, storage, handling, use and possible reclamation of the product. As per the studies carried out by the experts in this field, there is a very good scope of extending the useful life or conserving lubricants in our country. Basically, experience shows, that the following concrete suggestions and overall recommendations can be made concerning the handling of lubricants within the plant.

1. Select lubricants including hydraulic fluids, gear lubricants, cutting fluids, coolant, crank case oils etc. to obtain long service life.
2. Establish a good preventive maintenance programme.
3. Wherever possible, utilize a plantwide (or shop wise) multimachine circulations system to replace small single machine reservoirs.
4. Provide purification equipment for circulation and hydraulic fluid systems, to obtain optimum recycling wherever possible.
5. Survey to ascertain the nature and source of contamination, leaks, etc.
6. Attack the problem at source. Consult the supplying oil company.
7. Maintain a minimum variety by proper inventory control. The oil companies assist the consumers in this regard.
8. Know local regulations and regulatory bodies before deciding for final disposal or reclamation of oils.

In the modern composite textile mills or in a process house, the various petroleum products used under the category of lubricants and specialities mainly comprise of:

(a) Lubricant for all loss system
(b) Reuse (circulation or bath systems)
(c) Heat transfer fluids
(d) Crank case oils (D.G. sets etc.)
(e) Transformer oils
(f) Process oils
(g) Greases

In case of all loss system lubricants, the best way to ensure optimum utilisation is to ensure only the near optimum quantity is fed at a time. A careful control on the requirement or duty on the lubricant, should ensure that the correct quantity is fed. The oil holes must be clean and should give easy access to the bearing. The enthusiasm of the oil men to 'over lubricate' to be on the safer side, should be discreetly checked. Prevention of leaks, spills and drips should get due priority. A study made by the Mobil Oil Company showed that leakage from circulating/ hydraulic and other industrial systems approximates to 100,000,000 gallons a year and this

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Excerpts of the talk given at Workshop organised in Bombay by PCRA.

would require 5,500,000 man hours to provide make up. With proper leakage control, over 75% of this can be eliminated. In industries like the textile, foodstuff etc., this type of leakage further enhances the risk of spillage which will contaminate/spoil finished and semi-finished product. Losses due to leakages or over feeding in all loss systems can be substantial.

| Leakage * | Loss in 1 day gallons | Loss in 1 month bbl | Loss in 1 year bbl |
|---|---|---|---|
| One drop in 10 secs | 0.112 | 0.06 | 0.72 |
| One drop in 5 secs | 0.225 | 0.12 | 1.44 |
| One drop in 2 secs | 1.125 | 0.62 | 7.44 |
| Three drops/sec | 3.75 | 2.05 | 22.60 |

* Drops approx. 11/64 inch in diameter
One barrel = 55 gallons.

Several general measures to reduce leakages are as follows:

1. Use joint types and packing material for installation and maintenance work, that have proved satisfactory in service.
2. Train maintenance personnel in principles of proper installation of joints and packing. Maintenance surveillance to ensure proper execution of accepted procedures.
2. Minimize the number of connections and make oil lines and connections accessible for checking. Maintenance system should be free from excess vibration, mechanical strain, unnecessary twists and bends.

**Elimination of contamination**

Any foreign body contaminating the lubricating oil or any cross contamination by admixture with other process fluid may result in the loss of primary function of the lubricant. This will consequently result into reclamation or disposal as waste or down grading to non-critical application. Therefore, contamination of any kind should be eliminated or controlled to the highest degree possible.

**Circulating oil system contaminants:**

| | | |
|---|---|---|
| Cleaning solvents etc. | Grease from other bearings | Rust particles |
| Coal dust | Lint/cotton waste/ fluff | Rust preventives |
| Core sand | Metal chips | Water |
| Cutting fluids | Metal wear particles | Way-lubricant |
| Dirt | Packing/gasket | Weld |
| Drawing compounds | fragments | spatter |
| Dust | Paint flakes | Wrong oil |
| | Pipe scale | |

The following general recommendation will help in controlling sump contamination by foreign matter.

1. The reservoir cover, if removable type, should fit well, be gasketed and tightly bolted on.
2. The oil filter hole should have a fine mesh screen and a dust cover.
3. The breather hole should be provided with an air filter and checked regularly.
4. Suction should be equipped with a strainer to prevent dirt and other foreign matter from entering the system.
5. Sometimes, water may enter the system by condensation due to varying temperatures. The oil sump capacity should be such that sufficient time is allowed as dwell period to give time for water to get separated. Baffles may be used to keep the oil tranquil for sometime before it enters to suction line again. Regular draining of water from the reservoir must be made a practice.

Another type of contamination which will cause a lubricant to become a waste oil is caused by degradation products formed in the lubricant as a result of system operating conditions. For example, excessive high operating temperatures can cause oxidation of the base oil and the oxidation products formed could result in changes in viscosity, an increase in acidity and formation of varnish and deposits. Excess temperatures of oil may be the result of improper selection of system capacity, system malfunction or poor original design. While premium quality lubricants have high oxidation stability, proper system design and operation should help this inherent characteristic. Adequate capacity of the lubricant system or the use of an oil cooler will help control the bulk oil temperature during circulation. Sometimes proper oil feed rate assists in holding temperature to reasonable limits.

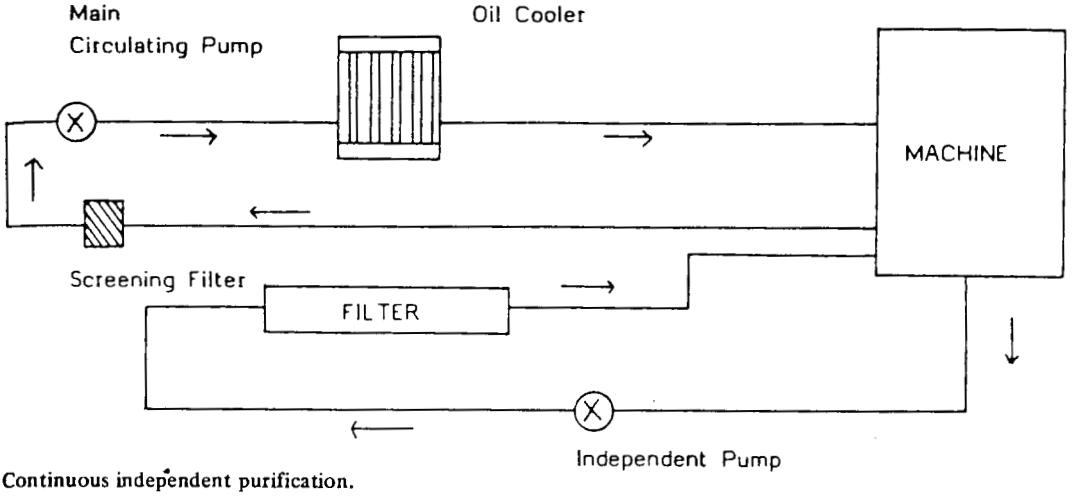
**In process purification**

Since the oil system has to be kept as free from contaminants as possible, to keep the oil clean during the circulation, in process purification should be adopted. This system may consist of bypass, full flow treatment, or a combination of the two incorporated into the system.

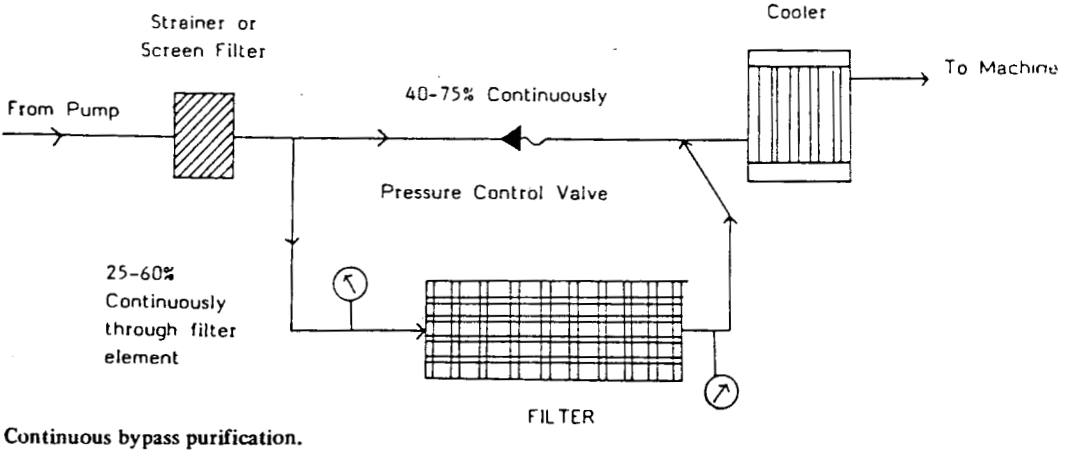
The above three systems are clearly explained in the sketches. There can also be periodic

batch purification, which is more suitable for transformer oil etc. In this method, the entire charge of lubricating oil or coolant is moved from the system. The oil may be allowed to settle, then reheated and passed through a centrifuge, reclaimer or other such system.

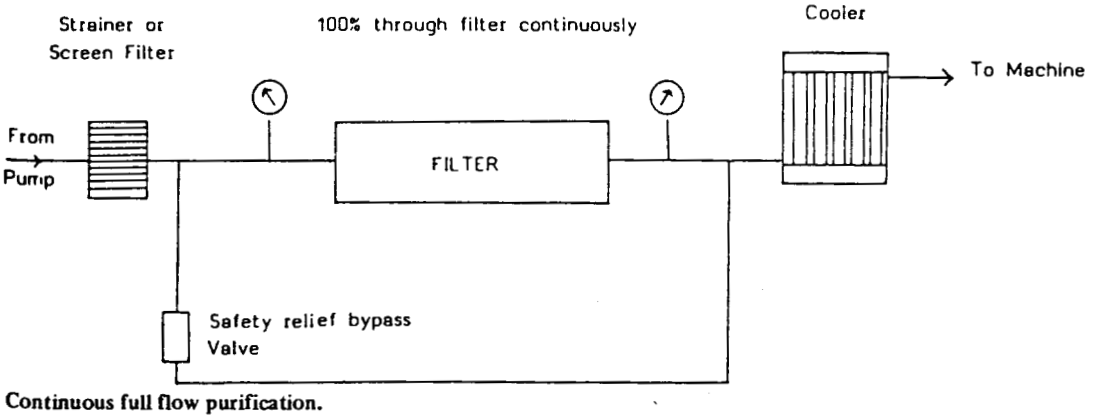
In another system called the Full-Flow and By-pass, the dirty fluid from the machine passes through the purification system at a full flow rate and a portion of the stream delivered to the machine is diverted and returned for further purification. Such a stream when utilizing




**Continuous independent purification.**




**Continuous bypass purification.**




**Continuous full flow purification.**

filtration can provide for gross filtration of the full flow stream and fine filtration of the bypass stream at a slower flow rate, with the combination yielding a cleaner fluid.

A comparison of four methods can be shown as below: see graph.

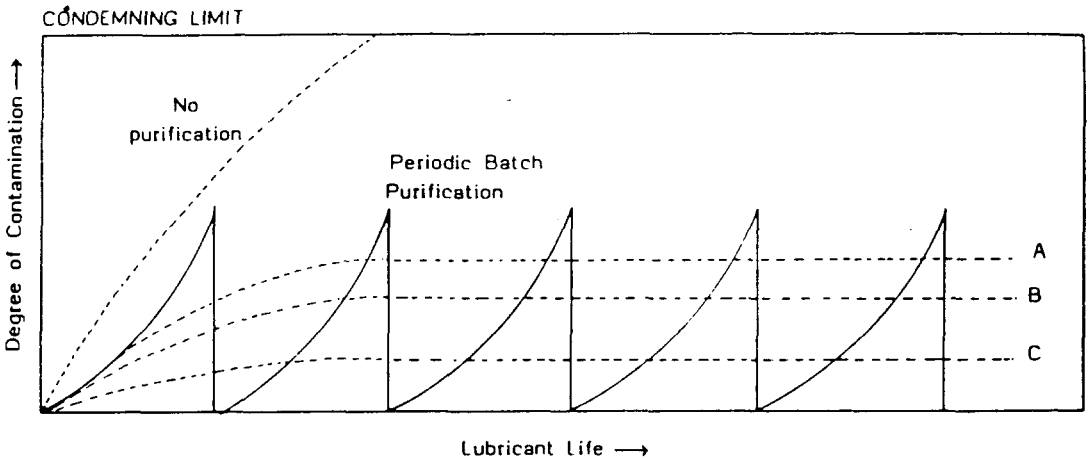
Amongst the different purification methods viz. settling, size filtration, clay, or depth filtration, reclaiming etc., the effectiveness to remove different materials varies. A rough comparison is given in the table.

To summarise, it can be said that the aim of all engineers and users of lubricating oil and specialities in the textile industry should be to ensure optimum utilisation of these products. A thorough study of receipt, storage, handling and of the various systems must be made. The useful life of a lubricant can be ascertained by some spot checks followed by detailed laboratory tests. The oil supplying companies can furnish the details and assist in ensuring optimum life of oils. Excess lubrication particularly in the loom shed, process houses, and sometimes in the bolsters should be avoided. Regular checks must be kept on the top up quantity and quality of heat transfer fluids.

In grease application, over lubrication and frequency of relubrication must be avoided by proper monitoring, should be adhered to. The management may make it mandatory to monitor all major lube oil consuming points. Wherever the oil can be purified for reuse, it must be done. The purified oil, if not suitable for a particular application, may be used at a less critical application.

| Materials | Settling | Size filtration | Clay filtration | Centrifuging | Reclaiming |
|---|---|---|---|---|---|
| Water | Yes | Slightly | Slightly | Yes | Yes |
| Solids | Yes | Yes | Yes | Yes | Yes |
| Soluble oil oxidation products | No | No | Yes | No | Yes |
| Fuels/solvents | No | No | No | No | Yes |
| Oil additives | No | No | Yes | Yes (along with water) | Yes |

Each day brings us closer to a world without petroleum. Man has yet to develop a viable alternate source of energy. The only way left to us is conserve petroleum products through greater efficiency in utilisation. It is, therefore, necessary to explore all the avenues where the lubricant can be conserved, life of oil in system can be extended, oil can be purified or reclaimed. This is the goal, the target for all users, may it be the Chief Engineer, Process house-in-charge, Weaving Master, Spinning Master, Maintenance Engineers, Supervisors, Workmen or Oilmen. This will not only increase the profitability of the unit, it will add to the prosperity of the nation.




(A) Bypass purification. (B) Full flow purification. (C) Combined full flow and bypass independent continuous purification.

The effectiveness of various methods can be judged from the graph.