CRS REPROCESSING SERVICES

A Global Partner in Fluid Reprocessing Management

CASE STUDY

Customer: Major Wheel Manufacturer
Site: Eastern Europe

96% Removal Efficiency Achieved with TUF Process

CHALLENGE

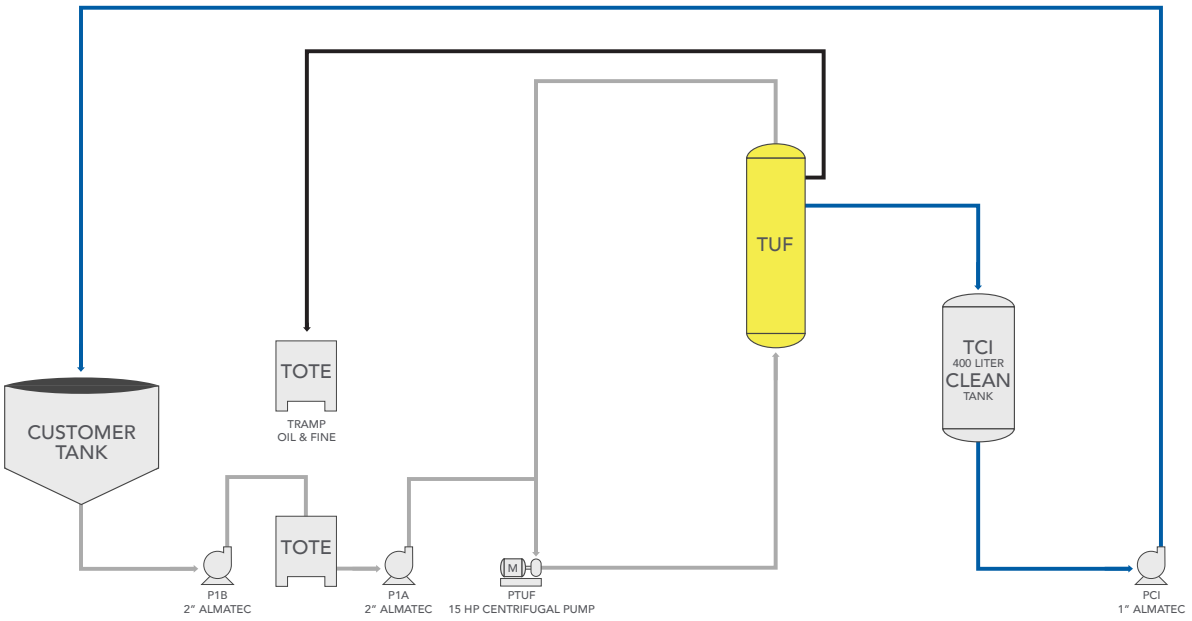
A major wheel manufacturer in Eastern Europe recently underwent a major modernization project where the focus was to shift to higher value added products. This modernization allowed the plant to expand beyond the traditional surface finish applied to the product mix of disks for heavy vehicles, trailer trucks, and buses into high value surface treatment. This new technology protects wheels from corrosion and maintains their shine and sheen and allows for easy cleaning. A large contributor to this new surface treatment is the cleanliness of the emulsion fluid lubrication that is used in the wheel manufacturing process. As with most manufacturing operations, the major challenge is to reduce the operation cost while maintaining or improving the end product quality. This wheel manufacturer identified several areas within the fluid reprocessing cycle where cost could be improved:

- Filtration of the fluid so that particles larger than 5 micron can be removed
- Filtration of the emulsion fluid to minimize the impact on the additive in the oil
- Maintain the emulsion stability for reuse
- Remove free (tramp) oil from the used emulsion

Test Unit used on-site at customer location

SOLUTION

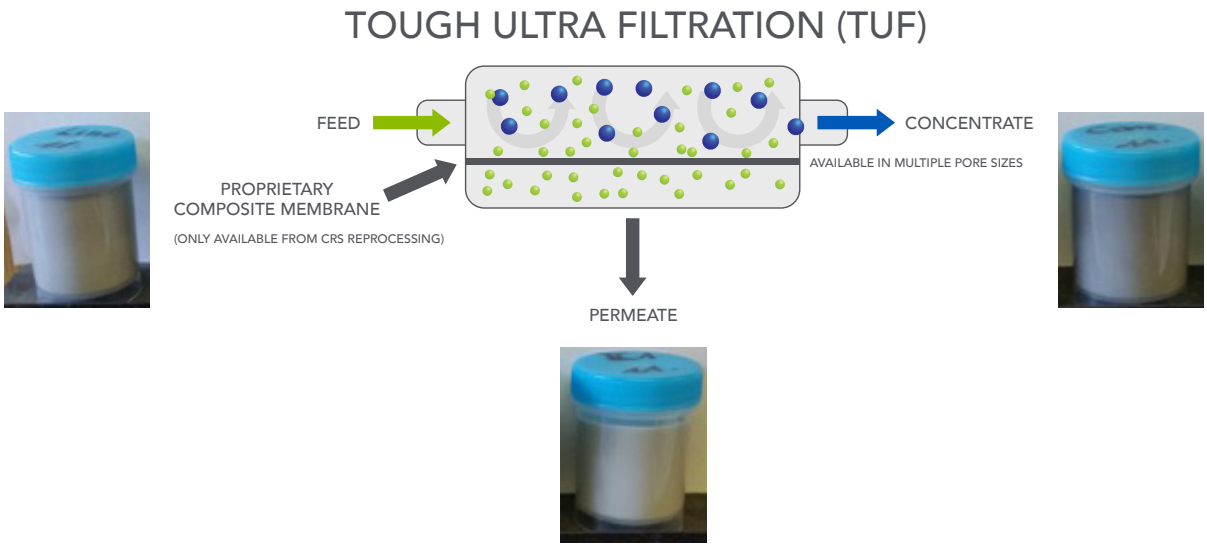
CRS Reprocessing, a custom engineering integrator of environmental services equipment, installed the Tough Ultra Filtration (TUF) unit to address the fluid reprocessing challenges. The TUF unit is outfitted with several membranes of different porosities which enable different levels of filtration without causing demulsification of the fluid and removing metal particles from the fluid. The TUF is outfitted with five membranes, identified as N, A, B, C and D. These membranes range from nano to microfiltration in porosity size. To validate the TUF unit's ability in this application without causing interruption to the manufacturing process, the TUF unit was set up as shown in the following PFD diagram.



During this set up, the TUF unit was operated with the D and C membranes. Data was collected on the D membrane for 16 days and the C membrane for 6 days. The data generated from the operation of the TUF unit was compared with the filtered oil without using the TUF technology. The initial fluid fill for the customer feed tank came from the in-line chip tank, where bigger particles were removed and virgin emulsion is added. The fluid did pass through a comb filter that has a100 micron porosity after machining. Additionally, this fluid after the comb filter is the same fluid that the process would see if the TUF was not in place.

The figure below shows the condition of the fluid as it is processed through the TUF unit:

- Fluid enters in the TUF membrane, which is the feed, where you can see the layer of free oil present.
- Fluid exits the TUF as Permeate, where the layer of free oil has been removed and can be re turned to the production line as reprocessed fluid.
- Fluid exits the TUF as Concentrate, where the layer of free oil is present. This fluid can be further reprocessed or disposed.



RESULTS

- Reduction in free oil
- Reduction in the number of metal particles in the fluid greater than 5 micron
- Reduction in solid content volume
- No impact on the additive concentration
- TUF D and C had **96%** removal efficiency with the treated fluid
- The TUF membrane was able to positively impact the cost factors identified in the challenge section

The data reveals that the free oil percent on average reduced from **1.5%** to less than **.5%** by volume. This level of reduction was consistent in both the TUF C and D membranes and shows the effectiveness of the TUF filtration system in removing free oils.

The table below also shows significant reduction in the number of metal particles from the line tank to the filtered TUF permeate. At an average income flow rate of 3,312 gallons per day, the TUF system operates at **96%** removal efficiency. This TUF reprocesses out 5.3 lbs. of dirt particles per day and only .02 lbs. of dirt particles are remaining in the average TUF permeate per day.

The additive package was measured by the lubrication supplier to confirm that the concentration present within the fluid pre and post TUF reprocessing was consistent. The concentration measurement compared favorably to the virgin sample measurements.

TUF Feed and Permeate Measurements

Feed Free Oil (%)	Permeate Free Oil (%)	Feed Particles >5µm (ppm)	Permeate Particles >5µm (ppm)	Feed Solid Content Vol. %	Permeate Solid Content Vol. %
1	<0,5	541	9	0,1-0,5	<0,1
2	<0,5	498	6.1	0,1-0,5	<0,1
1	<0,5	418	11.4	0,1-0,5	<0,1
1	<0,5	83	7.5	0,1-0,5	<0,1
1	<0,5	102	10	0,1-0,5	<0,1
1	<0,5	81	14.4	0,1-0,5	<0,1
1	<0,5	109	6	0,1-0,5	<0,1
2	<0,5	152	9.3	0,1-0,5	<0,1
2	<0,5	102	5.4	0,1-0,5	<0,1
1	<0,5	72	13	0,1-0,5	<0,1
1	<0,5	58	8.4	0,1-0,5	<0,1
1	<0,5	124	12.4	0,1-0,5	<0,1
1	<0,5	124	2	0,1-0,5	<0,1
2	<0,5	208	5	0,1-0,5	<0,1
2	<0,5	167	6.3	0,1-0,5	<0,1
2	<0,5	84	3	0,1-0,5	<0,1
2	<0,5	56	4.2	0,1-0,5	<0,1
1	<0,5	97	9.5	0,1-0,5	<0,1
1	<0,5	156	3.6	0,1-0,5	<0,1
2	<0,5	83	7.2	0,1-0,5	<0,1

This table represents a portion of the actual data that was collected during the test and is not intended to represent all of the data collected.