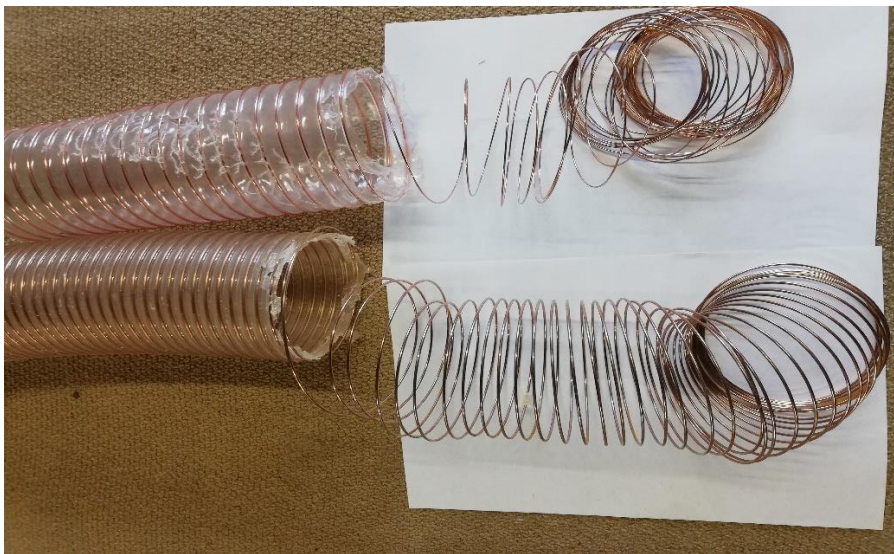


# **Flexible plastic (PU) hoses Recycling**

The recycling of flexible plastic (Polyurethane PU) hoses  
with copper-plated steel spiral.



## Summary

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# **B.T.R.C.**

## **A. In general.**

The recycling technology for the flexible plastic (PU) hoses with copper-plated steel spirals is based upon the BTRC development using UHP (Ultra High Pressure) water jetting to pulverize the PU in a one-step operation and cleaning the steel spiral ready for re-use.

The recycling of these hoses is different from the pulverizing of rubber hoses, dredging pipes, construction tracks and steel cord conveyors.

Here we concentrated on the speed of recovering of the steel spiral where the pulverization of the PU is less important.

The basic technology using UHP water jetting has hereby a different approach, the pressure, rotojetters and the orifices are adapted to this 'light' material. Also both the upstream and downstream process are different

The manipulation of the hoses is critical for the speed of process. Basically the pulverizing of the PU is less important than the cleaning of the steel spiral.

To be able to handle a world-wide recycling operation one need to consider some mobile units.

## **B. The recycling process.**

1. The upstream operation (basically the water technology)
2. The jetting operation (basically the UHP and rotating technology)
3. The downstream operation (basically the purification, drying and finalizing of the recycled PU and the recovered steel spiral)

## **C. The Upstream- and Downstream processes.**

Because the recycled PU product is a complete different product than the recycled (de-vulcanised) rubber, so we have adapted both the initial (rubber recycling) upstream and the downstream operations.

## **B.T.R.C.**

The recovering of the steel helical (spiral) wire requires a special 'collecting' device.

The downstream process required a shredding and grinding device to reduce the recovered PU and to bring it into an equal size and perfect purity.

Hereby the process temperature is not as critical as for rubber recycling.

### **D. The recycled material**

The jetted PU is collected, shredded and grinded into an equal size.



Recovered PU just after the jetting.

### **E. Speed of the recycling operation.**

The basic set up speed of pulverizing (recycling) operation is approx. 2,5cm/sec.

### **F. The energy and water consumption.**

The set up for the pulverizing has given a water use of 15,2 l/min (whereof some 85% is re-used) and an energy consumption of some 0,09 kWh/kg PU.

The energy consumption is directly related to the size of the flexible hoses and the speed of the operation. The choice of the UHP pump system can reduce the energy used but this has a direct relation with a much higher maintenance costs.

## **B.T.R.C.**

Another reason why there is a low energy use is the fact that the energy is exclusively designated to 'clean' the steel spiral and not to cut or destroy it. The water consumption is extremely low because of the small thickness of the PU and the PU-hardness (Shore) is low. The water consumption is depending on the size, the type of the hose and the speed of the operation.

### **G. Cost of the recycling operation**

The main goal was to find the efficient parameters for the highest speed of processing (cm<sup>2</sup>/sec) with the minimum energy (kwh/kg PU) used.

Beside the cost issues there was the value of the recycled material (PU and steel spiral) as an important element to determine the best financial results.

### **H. Safety issues.**

The UHP water jetting of some 4.200 bars with water speed of some 850m/sec (Mach 2) is a dangerous operation and needs special precautions.

The machinery is designed for taking this important issue into consideration.

### **I. Green issues / CO<sub>2</sub> reduction.**

The CO<sub>2</sub> reduction using the BTRC technology is basically the sum of 2 issues:

1. The CO<sub>2</sub> emission reduction due to the recycling of the PU material.
2. The CO<sub>2</sub> emission reduction due to the recycling of the steel spiral.

The re-use of the recycled PU is a reduction of: 2,65 - 2,86 ton CO<sub>2</sub>/ton PU.

The re-use of the recycled steel wire is a reduction of: 1,90 ton CO<sub>2</sub>/ton steel.

### **J. Alternative recycling solutions**

There are no alternative recycling solutions ! There are always the shredding or pyrolysing options which are destroying good material and sadly adding CO<sub>2</sub> emissions. Moreover these 2 are both quite expensive solutions 'to get rid' off the End-of-Life flexi hoses.

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