PRODUCTION

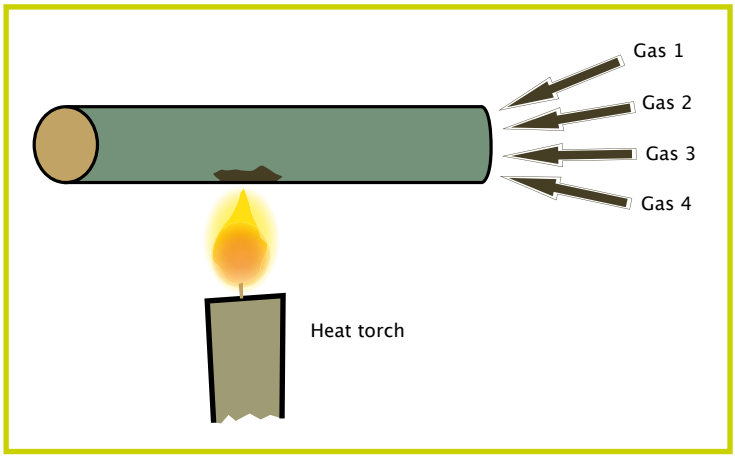
Production

The production of fiber can be divided into two parts, the production of the glass (the actual fiber) and the application of the sheath. Fiber is not manufactured in so many places. In Denmark, OFS in Brondby (a part of Copenhagen) produces fiber. Yet, OFS only makes the fiber. In Brondby we also have a company, which applies sheaths to fibers. The company, named Draka, get their fibers from Holland and apply the sheath in Brondby.

Fiber Production

To produce fiber you will need a quartz tube, approx 2m long and with a diameter of approx 3cm. The tube wall thickness is 5mmm. The quartz is so pure that it can not be produced in Denmark – we must import it from Germany. The tube is now mounted on a lathe with a special heat torch. Then the tube is heated and rotated, and at the same time different gasses are blown through the tube. The gasses react to the heat, and particles deposit to the inner wall of the tube, near the heat torch. The gas torch moves slowly, back and forwards, and gradually 40-70 layers deposit on the surface. At last the heat increases and simultaneously the air is sucked out. As a result, the newly formed inner tube implodes (collapses) to a kind of fiber rod (called the perform). This rod becomes the fiber core/cladding.(the gasses forming the core, the glass rod the cladding) By controlling the composition of the gasses, you can make many different types of fiber.

Figure 1



Different gasses are blown through the quartz tube. The gasses react to the heat and deposit a solid fiber substance on the inside of the tube. At last, this substance becomes the fiber core.

Figure 2

The gasses are led through the heated quartz tube. This is from OFSis factory in Denmark

The quartz tube containing the fiber rod is mounted in a draw tower, heating up the glass. Now the draw process can begin. The fiber is drawn from the bottom of the tower and wound on winding drums. The tower is approx 30 m high and the fiber thread is drawn with a speed of close to 100 km/h. From one single fiber rod you can make approx. 900 kilometers of fiber.

Figure 3

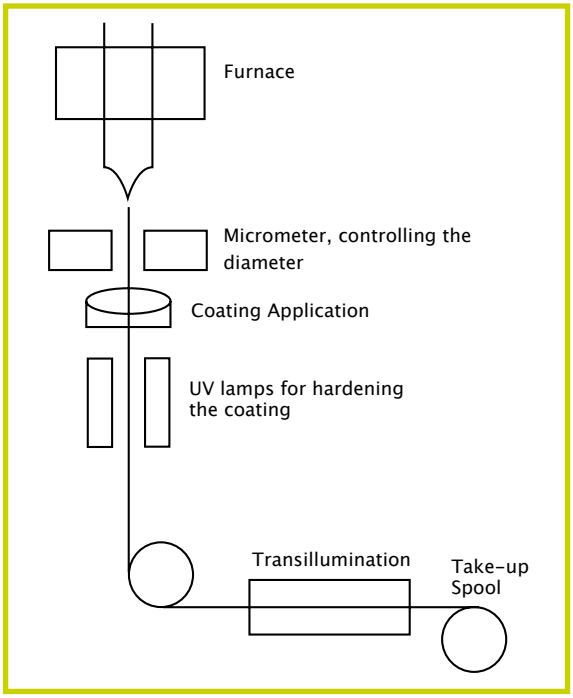
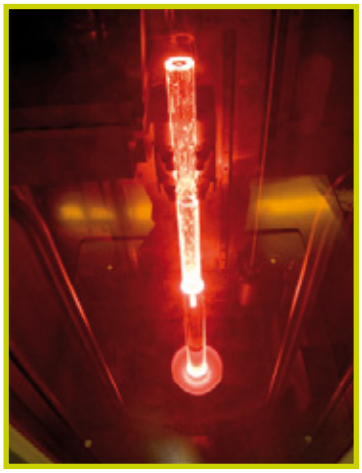


Figure 3 shows how a typical draw tower is constructed. A furnace at the top followed by a device, controlling and adjusting the fiber diameter. Below the diameter control the coating is applied. The coating is hardened by means of some fluorescent tubes. The fiber is then transilluminated to check if the proportions between the core, the cladding and the coating is correct. It is also checked if the layers are circular, and if the centers are placed correctly. Possible defects will be cut out afterwards.

Figure 4



The heated glass rod (the preform) at the top of the draw tower, also from OFSis production facility.

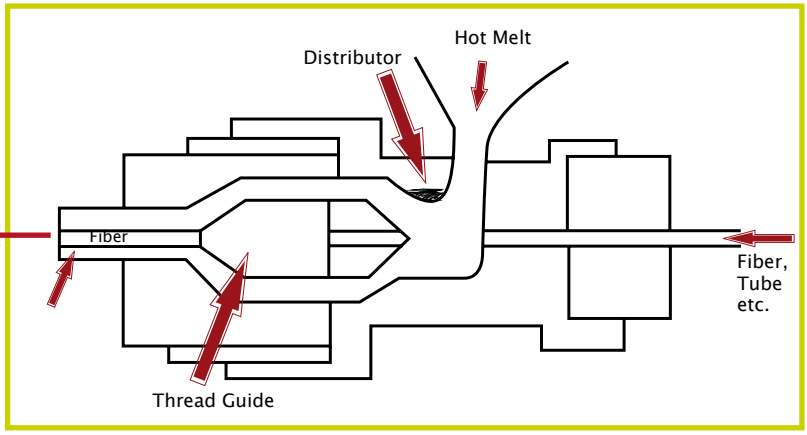
Figure 5

A fiber spool – The fiber is now delivered to the coating manufacturer, who applies the coating. This is from Draka, the fiber her will be transformed into a cable in no time.

Cable Production

An industrial technique called extrusion is used to apply hot plastic (or some other material) around what is going to be the fiber core.

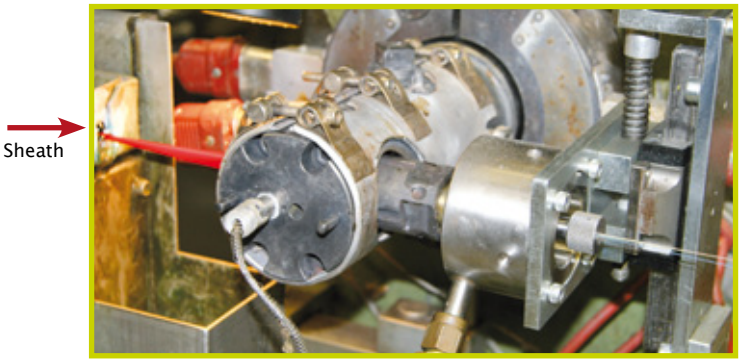
Figure 6



A schematic presentation of the function of an extruder. Tubes, fibers or the like are introduced from the right. The melted material, which later is going to be the sheath, is taken around the fiber. A cylinder then presses the hot and soft melt in place, and at last you have a fiber enclosed by a correct sheath.

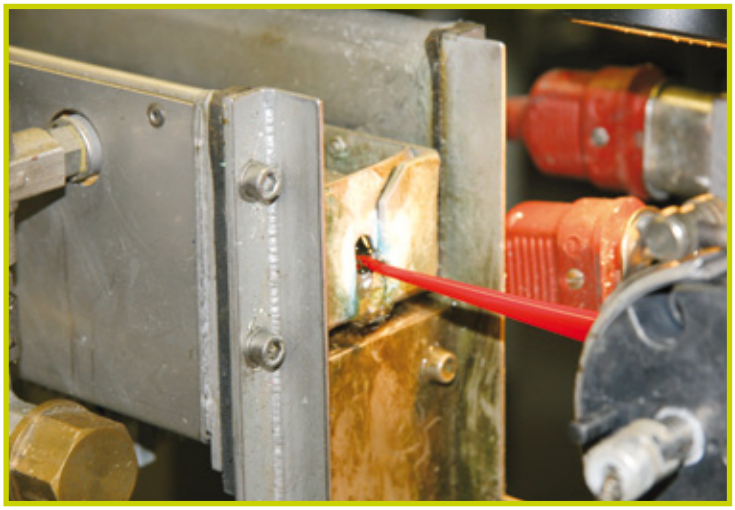
But our coated fiber has not yet left the extruder. A screw conveyer now presses the very hot material (several hundred degrees celsius) out through a hole. Entering the air, the hot sheath or tube cools down and shrinks. Subsequently, the cable enters a water bath, cools down again, now reaching its final size.

Figure 7



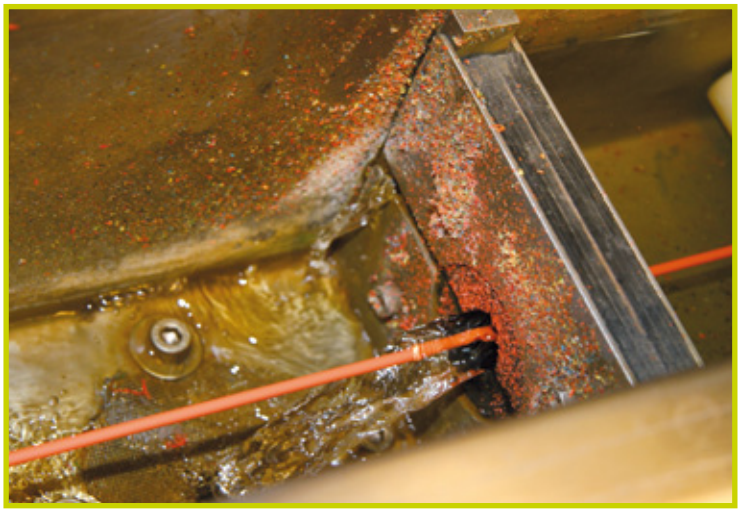
A fiber entering the extruder, on the left hand side, and leaving on the right hand side . Picture is from Drakas production in Denmark

Figure 8



Leaving the extruder. When the fiber has left the extruder, it is cooled down in a water bath (from Draka)

Figure 9



Entering the water bath

The finished cable is woud up on spools, ready to use. Today, many thousand kilometers of fiber is laid out in Denmark and in the rest of the world, due to the reasons described in this fiber guide.