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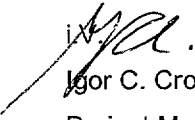
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Subject: Final Report, to contract 99 / 180 our reference A 0900-036

**FINAL REPORT PHASING OUT CFC-11 IN THE MANUFACTURING OF
FLEXIBLE PU-SLABSTOCK FOAM THROUGH THE USE OF CO2 BLOWING
TECHNOLOGY AT SÜNGERSAN A.S.**

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1. INTRODUCTION

The equipment was shipped end of July and arrived in Turkei beginning of August whereby we have to note that the equipment was not send directly to Bursa (2 hours from Istanbul) but to Ankara (10 hours from Bursa). This inconvenience brought higher transport costs to us as well to the final end user Süngersan.

The actual installation of the NovaFlex® CO2 block equipment started end of September 2000 due to the fact in August customs are closed in Turkei and in this month most of people are in Holiday. Most delays could have been avoided by sending the equipment directly to Bursa. This rerouting of the transport included additional transport costs for Hennecke as well as for Süngersan, secondly due to long custom clearance, more then one month, we had to send the tools with a second transport. Our office in Istanbul had to do a lot of work to get the tools to Bursa due to the fact the customs in Bursa where not involved in the first shipment and the client rightfully did not want to get involved into the burocratic customs clearance.

Some changes have been applied to the original installation plan but in full agreement with Hennecke and the client Süngersan.

2. INSTALLATION

The installation has been performed by a Mechanical and electrical specialised personnel of Hennecke.

Süngersan had already placed the CO2 tank before our arrival and the installation has been performed according to plan with exception of the placement of the TDI and Polyol metering pumps.

The reason for placing the pumps next to the tanks instead of next to the mixer was that an opening in the outside wall was not possible. Our installation engineer found out that the physical build up of the wall would not permit an opening without substantial supporting structure.

The change of position of the metering pumps of Polyol and TDI had as only negative point some extra days installation due to the longer pipe runs.

The total installation time took 3 weeks for the mechanical parts and 1 week for the electrical connections.

3. DRY RUN

After the installation of the mechanical and electrical connections a Process engineer has performed the dry run start up and commissioning with the support of a Software engineer for quick troubleshooting.

The dry run is performed with all the raw materials loaded whereby the pumps are tested for:

- Leakage
- Pressure output and stability
- Calibration of the pumps and flowmeters
- Electrical and software test

No problems incurred during the dry run testing, the time required was app. 3 days.

4. START-UP and COMMISSIONING

The commissioning with good foam produced has been completed on the 17 of November. Whereby, only one of the additives indicated by us was not available for the start-up, Süngersan provided the right additive inside a short period, app. 2 days. The total time our Process engineer followed the foaming was app. 2 weeks whereby he also provided the training in use of the machine, maintenance etc.

We have produced several grades of foam with the following densities:

14 - 17 - 20 - 28 kg/m³

whereby the total output of the machine was app. 180 kg/min.

The length of runs for the several densities was app. 1 hour due to the fact the tank storage capacity of H Süngersan is limited (20 T of polyol and 20 T of TDI).

Due to the fact that during the Dry-Run we had already tested all the equipment, Süngersan provided the right raw materials and we had the formulations no problems with regard to the foam quality occurred.

The only negative point we have to note was the conveyor system which was not able to reproduce different speeds, we had to adjust the output of the machine to a fixed conveyor speed. The reason is that the conveyor speed needs to be constant during a production run otherwise the foam will be compressed and stretched leading to tear in the foam.

It would be recommendable when defining the projects to look into these details and eventually propose new electrical motors with frequency controlled AC driven motors in order to remove the inaccuracies of the mechanical parts. Due to the fact this effect will have direct effect on the yield, note that this is a refinement but will be appreciated with high quality foam producers.

We have to note that due to the fact Süngersan has not a chemist and therefore we had to provide all the formulations, this will limit them in making more grades then what has been produced. Further to the problem they will incur when changing the raw materials from the ones proposed by us. For the future they will seek advise from us and from the raw material suppliers in order to enhance their product palette.

We believe, as also stated by Süngersan, that the conversion to CO₂ has been very well accepted also because the working environment has improved substantially. During their previous production with MC the exhaust gasses reached unbearable levels. For this environmental benefit Süngersan should be very grateful to UNIDO for implementing LCD and not MC conversion.

5. EXISTING EQUIPMENT DISMANTLING

As you will see from the photograph at the end of the report the existing metering units have been dismantled and removed. Furthermore, our equipment does not contain pumps with which CFC can be used and being high pressure units the existing low pressure CFC pump cannot be used, this pump has been in any case dismantled

The first foto shows the placement of the activator metering units in place of the existing units and the placement of the TDI and Polyol metering units.

The second photo shows the placement of the mixer, electrical cabinet and the old cabinet for controlling the conveyor.

6. RECOMMENDATIONS FOR FUTURE PROJECTS

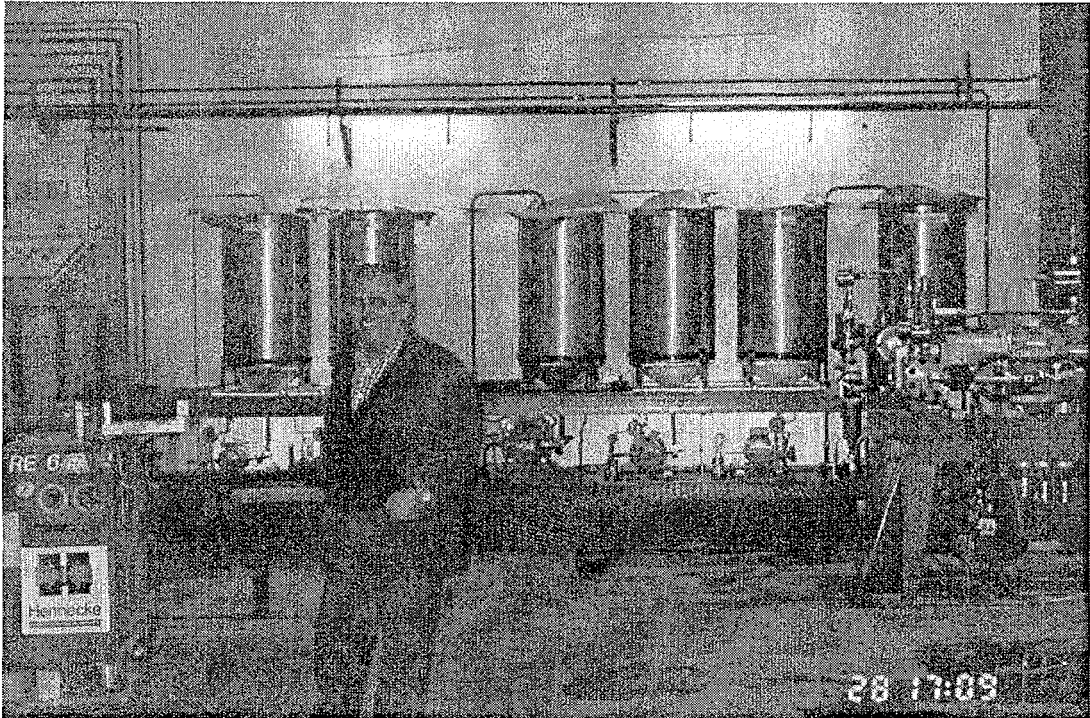
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Customs clearance should take place in the city or nearest customs office to the final end-user, because the local customs office most of the time is already acquainted with the company and additional transport costs are avoided for the end-user as well as the supplier (which needs to insure the equipment until the final installation).

Conveyors should be carefully checked and eventual change of electrical motors promoted in order to reduce the yield loss.

End user companies should have well trained chemists so that in case the requested raw materials from the supplier are not available the formulations can be corrected. Note that there are many raw material suppliers and often the proper composition is not known and therefore the supplier of the equipment can not know how to modify the formulations.

First Photograph with activator metering units, TDI and Polyol metering units.



Second photograph, left new electrical cabinet, right old cabinet and mixer unit

