

**KLEA<sup>®</sup> 407A**

**Case Study:**  
**Schanis Shopping Centre Retrofit by Kalte 3000**  
**AG, Landquart**

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**INEOS Fluor**

The shopping centre in Schanis has been in existence since 1968, and has been expanded several times through the years.

## Objective

To construct a modern central refrigeration installation, designed with one combination unit each for high and low temperature refrigeration. In the winter it must be possible to use the waste heat from the refrigerators for heating the supermarket. In the course of the retrofit the electrical control system also had to be brought up to date.

## Design

After intensive discussions it was decided to install a Bock tandem unit for the deep-freeze plant. For normal refrigeration the existing Dam 4-370 collector unit was used, but it no longer had sufficient capacity for low temperature refrigeration.

The Refrigeration Contractors Kalte 3000 recommended KLEA<sup>®</sup> 407C as the best refrigerant to meet the needs of the plant. In order finally to form a clear assessment of KLEA<sup>®</sup> 407A and R-404A, it was decided to operate the deep-freeze plant with the refrigerant R-404A for the first 3 months. The plant was then to be switched over to the refrigerant KLEA<sup>®</sup> 407A, in order to compare their capacities and thermodynamic properties. For this purpose current consumptions, operating times and temperatures were measured and recorded for periods of two weeks each.

## Retrofit Stage 1

In order to interrupt the operation for as short a time as possible, the first step was to install the new refrigeration plant for the deep-freeze. During a long weekend the deep-freeze display unit was connected to the new plant. At the same time the display units electronics were converted, equipped with new satellite control units, and connected to the remote guidance system. On Monday the work had progressed so far that the plant could be set in operation, and on Tuesday the customers were once again stocking up with deep-frozen products.

## Retrofit Stage 2

In the second stage we installed the existing unit, which was now free, adapted it to ester oil, and converted the refrigeration positions to KLEA<sup>®</sup> 407C and connected them one after the other. This plant could also be equipped with the latest control equipment, so that remote supervision became possible.

After an operating time of 7 days we changed the refrigerator oil in both plants once again, to reduce the residual mineral oil content to the specified minimum value. In both plants the full condensation heat is directly used in the shop and in the storeroom by means of super-quiet Contardo condensers. When not required, it is switched over to external condensers.

## Switching the Deep-freeze Plant from R-404A to KLEA® 407A

To come now to what is perhaps the most interesting point for constructors of refrigeration plant, the plant was measured for two weeks under the same external conditions. It was then converted to KLEA® 407A and put back in operation. It quickly became clear that there were no significant alterations in terms of exhaust temperatures or operating times.

At that point it could therefore be said that the report of a reduction in capacity of up to 10% had not been confirmed. For more precise information we had to wait for the evaluation of the recorded data.

The evaluation provided the following picture:

(AVERAGE VALUES)	R-407A (KLEA® 407A)	R-404A
Exhaust temperature:	84.1°C	82.5°C
Compressor operating time:	78.5%	79%
Current consumption:	100%	105%

It can therefore be stated that in terms of energy consumption KLEA® 407A is approx. 5% better than R-404A. The GWP of KLEA® 407A is also lower by almost half. The temperature glide was not seen as a problem.

# KLEA<sup>®</sup> 407A



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