PROGRESS AND TRENDS IN AIR INFILTRATION
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VAV - DUCT SYSTEMS - SIMULATING

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1.   INTRODUCTION

VAV - air conditioning system makes it possible to
control indoor conditions even when the heat loads
are changing. But this is possible only when each
part of the system works as it is intended to
work.
When the air flows varies in a large range, it can
cause situations, where pressure loss of some flow
dampers are out of their operate range. This is
possible especially when the system is large and
the velocities are high. This means that the air
flow is not correct. Also increasing noise levels
may appear.
Because of increasing lack of space, it's impos-
sible to use large ducts to ensure systems
function under all conditions. So how we can be
sure that the system works ?

2.   SIMULATING PROGRAM WITH EASY USER INTERFACE

To solve this problem, we have developed a compu-
ter program with which we can easily dimension the
ducts, simulate different air flow situations in
VAV-systems and easily make pressure- and
sound-calculations for each situation. We can also
simulate different placings of the pressostat,
which controls the fan unit.

2.1.   Draw a line scheme of the duct system

The user interface of the program is based on
graphics. This means that it is quite easy to in-
put a duct system in to the program. You only need
to draw a line scheme of the system. The program
can deduce from the scheme most of the needed in-
formation (connections, duct lengths, bends etc).

2.2.   Select dampers and diffusers from pull-down menues

The dampers, attenuators, diffusers and other
units can be selected from product menues of the
program. The menu system is build up like a tree
and on the bottom there are menues consisting
single-loss dampers, constant-flow dampers,
VAV-dampers, sound attenuators and various types
of diffusers.

2.3.   Copy branch

If you want to copy some branch in to another
place, you only need to show with the cursor which
branch and where to copy.

2.4.   Low mistake possibilities

So it doesn't take much time to input even large
duct systems. Possibility to make input mistakes
is quite low because all mistakes are immediately
shown in the picture, which is impossible if the
user interface is based on table.
When you want to change informations for some part
of the duct system, you only need to point the
part with the cursor and then select new values
from the menu or give the new values in a small
window.

2.5.   Making calculations

Various different calculations can be made with
the program. First balance the duct-system when
the program calculates the total pressure needed,
positions of the single-loss dampers and the
pressure loss of the other parts.
Then simulate different air flow situations.
Simply show the dampers which have different air
flows and then give the valid air flow. Also show
the place for the pressostat.
In simulated air flow situations you can make the
sound calculations. If you want to look at some
route, simply show the beginning and the end of
the route.
You can also get a partlist of procucts needed to
build up the duct system.

2.6.   Outputs

In pressure drop calculations (balancing or simu-
lating), there are four possibilities for output.
You can i.e look at a route, when the program
draws a curve from which you can see how the
pressure drops in each part of the route. You can
also check the operating points of the dampers.
In sound calculations you can take out a route and
check how the sound is generated in each part. You
can also make automatic sound calculations, which
means that the program calculates the sound levels
from the fan to each diffuser and outputs the
sound levels for the diffusers.

3.   CONCLUSION

A duct system simulating program makes it easy to
simulate all possible air flow situations of the
current VAV-system. With the program consultants
can easily find out possibilly occuring problems
in the system and correct them immediately. It is
much cheaper the correct the system on a screen
than to do it in an existing building.