SUMMARY

The release of manure gases and other odours from faeces and urine is one of the main sources creating bad animal and working environment in pig houses. The release also affects the atmospheric environment. The design of the ventilation system affects the air movements in the house and the air patterns around the manure surfaces in the house. The air movements in the house also affect the air patterns in the manure channel and the air exchange through slatted floors. The air exchange through the slatted floor is a main source of air with high concentration of manure gases entering the animal and working area of the pig house.

The aim of this project was to develop a method determining the air exchange through slatted floors with tracer gas technique and to examine how ventilation system and ventilation rate affect the air exchange.

With tracer gas technique you inject a tracer gas in the room. With knowledge about how the tracer gas varies with time and in space you can get information about total and local air exchange rates, ventilation effectiveness, capture effectiveness and the distribution of the gas in the room. In this investigation tracer gas technique has been used to determine the local air exchange rate, the ventilation effectiveness and the air exchange through the slatted floor. The air exchange through the slatted floor has been used to determine the ammonia release from the manure channel.

The measurements were done in a pig fattening house at JBT’s research farm “Alnarp Södergård” during two measuring periods corresponding with two growing periods. The pig fattening house has 8 pens (9 m²) with 6 pigs in each pen. In total 48 pigs. The manure channel is 1.2 m deep and 1.1 m wide. Two fans placed in the south wall and in connection with the manure channel, respectively, make two possibilities to exhaust air from the pig fattening house, high air outlet (HE) through the south wall and low air outlet (LE) through the manure channel. The low air outlet could be done directly through the manure channel or indirectly through a separate exhaust channel parallel with the manure channel. The ventilation rate could be varied between 400 and 7500 m³/h and was measured continuously by two impellers. During the investigation the air exchange through the slatted floor was examined at two ventilation rates, with two types of air inlets and three types of air outlets. In addition, six rubber mats has been placed in the manure channel to decrease the air movements. The rubber mats were placed in the manure channel in such a way that a separate room of the channel was created under each pen. The tracer gas (SF₆) was pumped into the manure channel and injected in five places, one under each pen. The concentration of tracer gas was measured in the house, in the exhaust air and at five places in the manure channel by an infrared spectrophotometer.

The conclusions of the investigation are; tracer gas technique is an interesting method to determine the air exchange and the ammonia release through the slatted floor with different ventilation systems; the air exchange through the slatted floor was 10-15% of the ventilation rate with high air outlet (HE); the air exchange through the slatted floor was only 1% of the ventilation rate with low air outlet (LE).